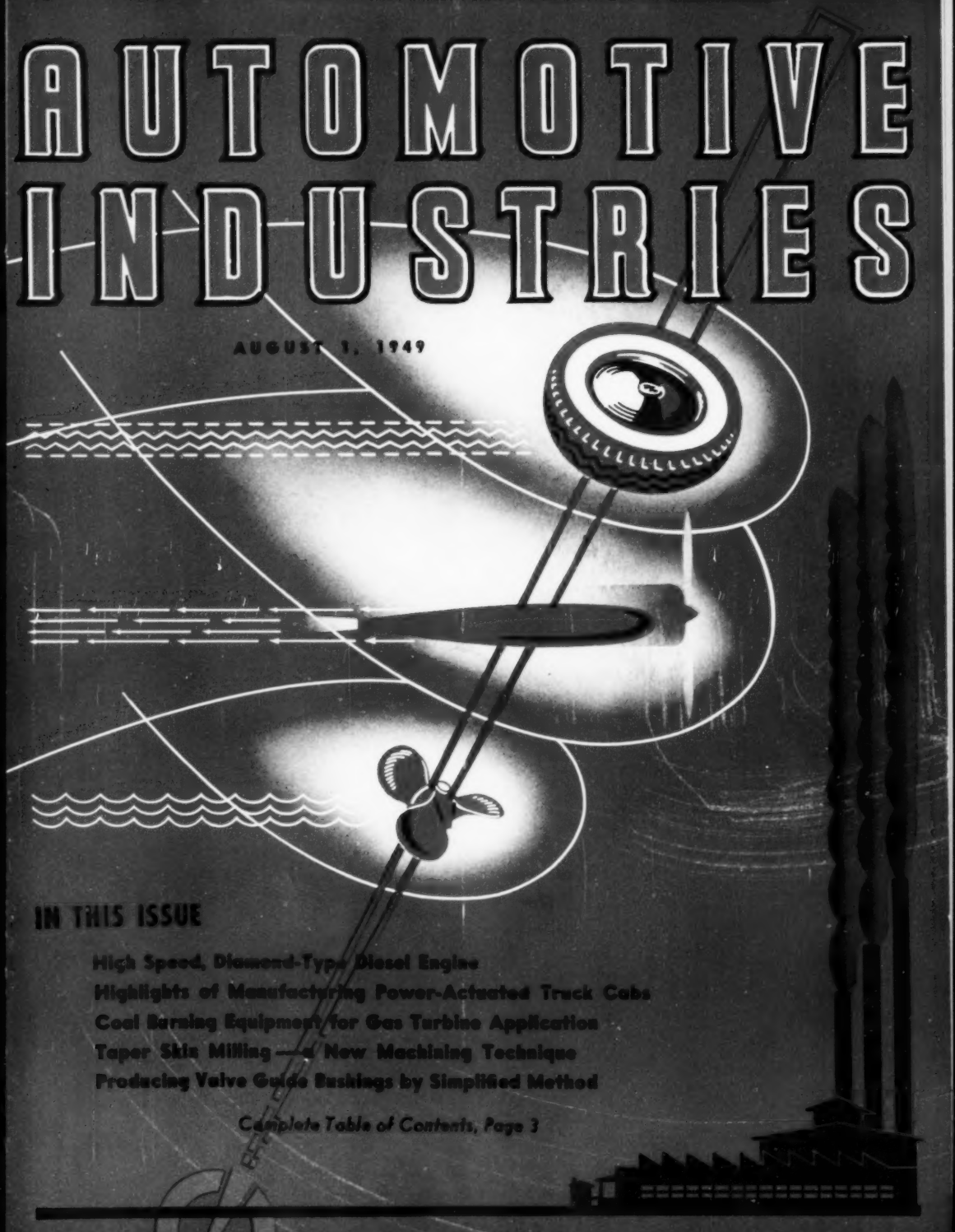
AUTOMOTIVE INDUSTRIES

AUGUST 1, 1949



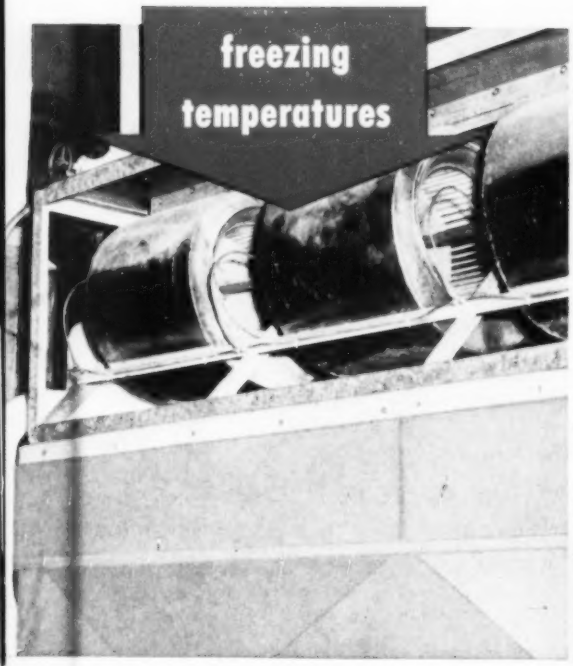
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Highlights of Manufacturing Power-Actuated Truck Cabs
Coal Burning Equipment for Gas Turbine Application
Taper Skiz Milling — a New Machining Technique
Producing Valve Guide Bushings by Simplified Method

Complete Table of Contents, Page 3

A CHILTON PUBLICATION

Here's ONE grease that withstands





Bearings in electric motors and fan shafts in a midwest cold storage plant are exposed to storage-room temperatures of 32° down to −10° F. The grease, applied by pressure gun, has to flow through ¼" copper tubing to reach the bearings. At the low temperatures, conventional greases continuously gave application and lubrication troubles.

The problem was solved by Stanolith. Despite freezing temperatures, this unique product flowed readily through the tubing and provided safe lubrication for the bearings.

Bearings in the can-washing equipment shown above are subjected to the severe washing action of water at near-boiling temperatures of 180° to 200° F. This combination of heat and water proved too severe for conventional greases and posed a lubrication problem in this midwest plant.

At the suggestion of a Standard Oil Lubrication Engineer, the job was given to Stanolith Grease, a lithium soap product with the unique ability to withstand both heat and water.

In six months' service, Stanolith has provided trouble-free lubrication for the bearings. Moreover, Stanolith has been used successfully for lubrication of bearings in the plant's electric motors and conveyor systems. Its versatility has eliminated the cost and trouble of stocking special lubricants.

Stanolith Grease

If heat, water, or low temperatures interfere with proper lubrication in your plant, try Stanolith Grease. A Standard Oil Lubrication Engineer will be glad to give you more information about this versatile product.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD

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How STAINLESS STEEL VALVES Defeat CORROSION... HEAT...IMPACT

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The macrograph, (circle), shows grain flow in an exhaust valve head forged from austenitic stainless steel containing 21 percent chromium and 12 percent nickel.

Repeated heating and cooling never hardens this austenitic nickel alloy, nor will the metal injure valve seats. The *ductility* of "21-12" allows valves to quickly reseat themselves in large engines where exhaust openings of five to ten inches in diameter may warp out of round when the engine warms up on its first run.

Valves shown here are products of Michigan Engine Valve Company, Detroit ... pioneer manufacturers of poppet valves. Of all materials tried during years of experimentation, Michigan engineers found "21-12" stainless the most suitable for both head and adjoining portion of stem exposed to hot, corrosive exhaust gases.

To resist guide wear, stems of Type 3140 nickel-chromium alloy steel, heat treated to 30-35 Rockwell C, are flash welded to these heads. Michigan also finds Type 3140 forged nickel-chromium steel well suited for head and stems of intake valves.

Many types of engines use Michigan nickel cast iron valves... made by a special process that fuses nickel-chromium cast iron heads to Type 3140 steel stems. Michigan also produces one-piece nickel-chromium cast iron valves.

We invite consultation on the use of alloys containing nickel. Send us details of your problems for our suggestions.



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AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

August 1, 1949 Vol. 101, No. 3

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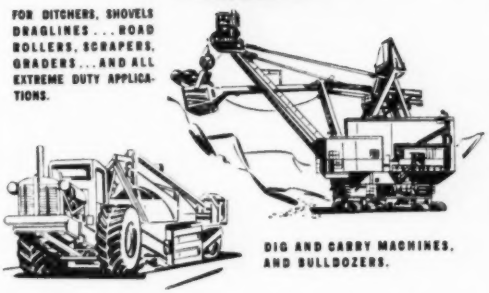
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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.





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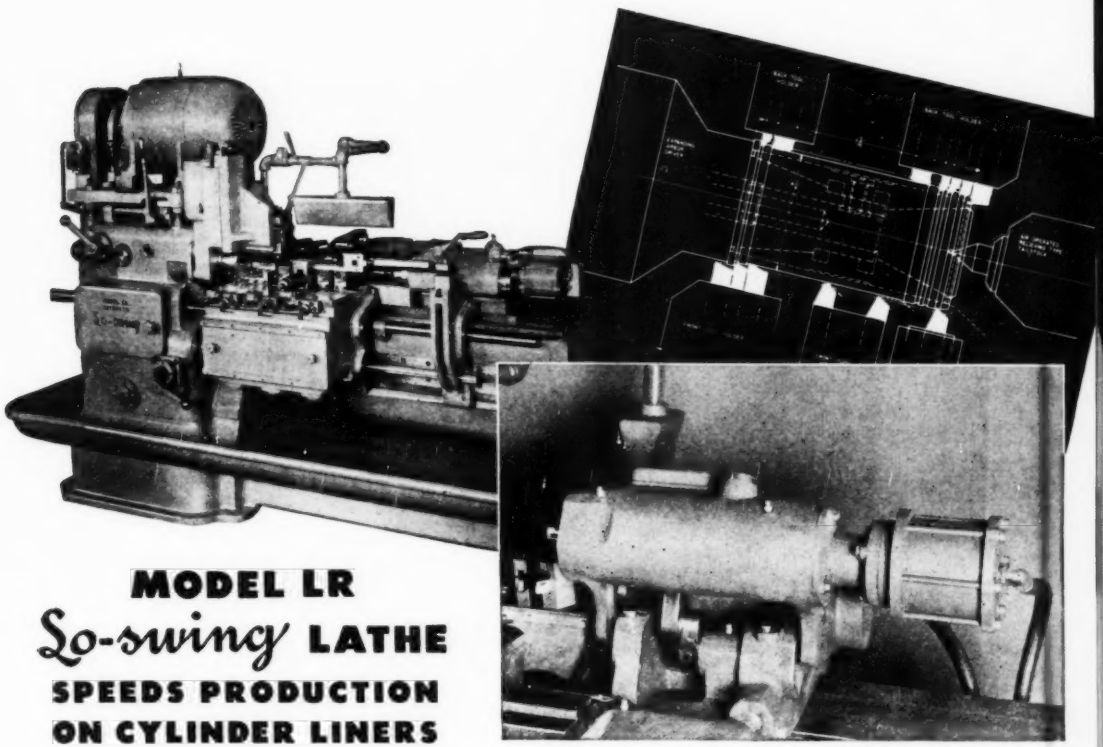
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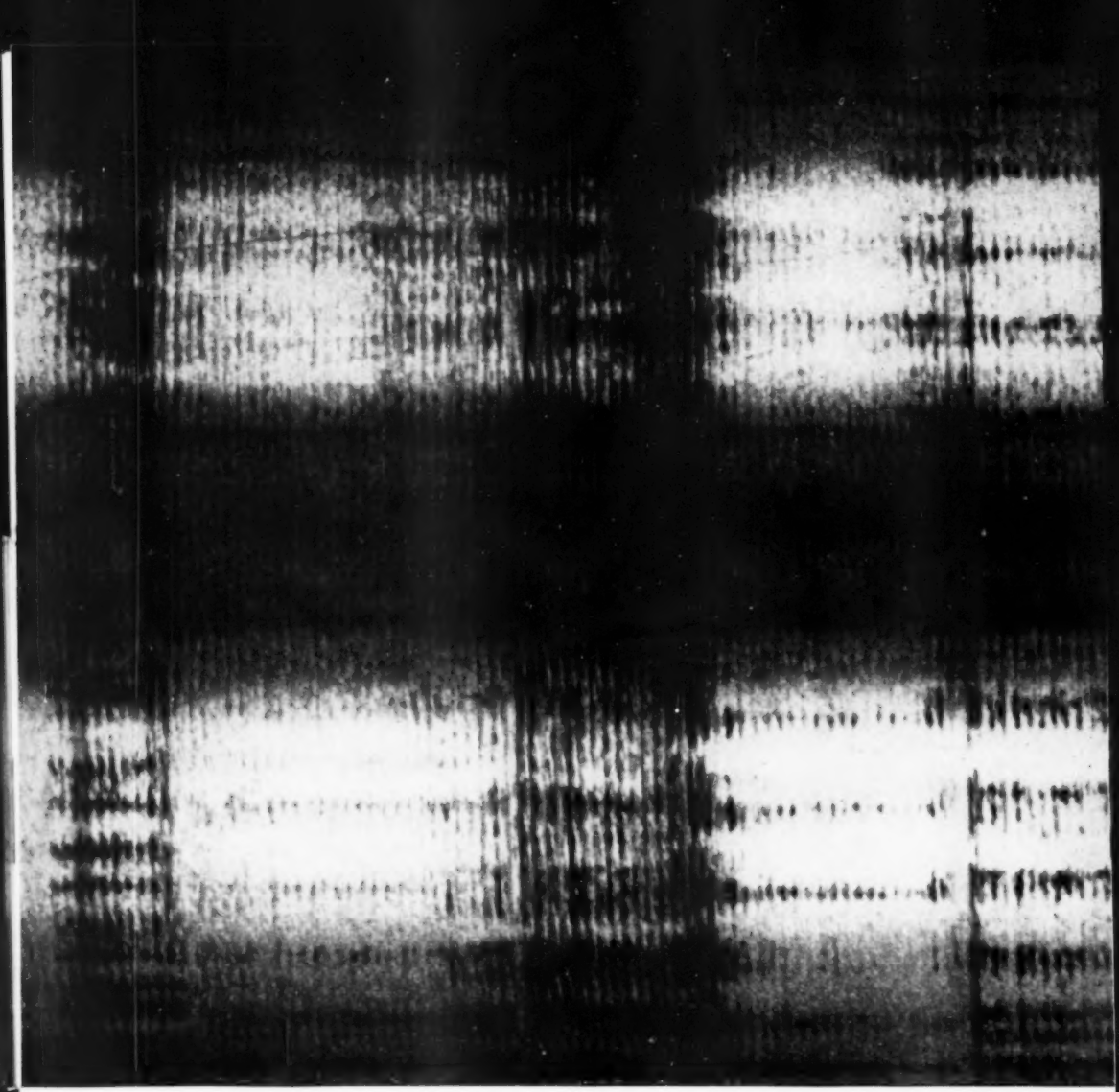
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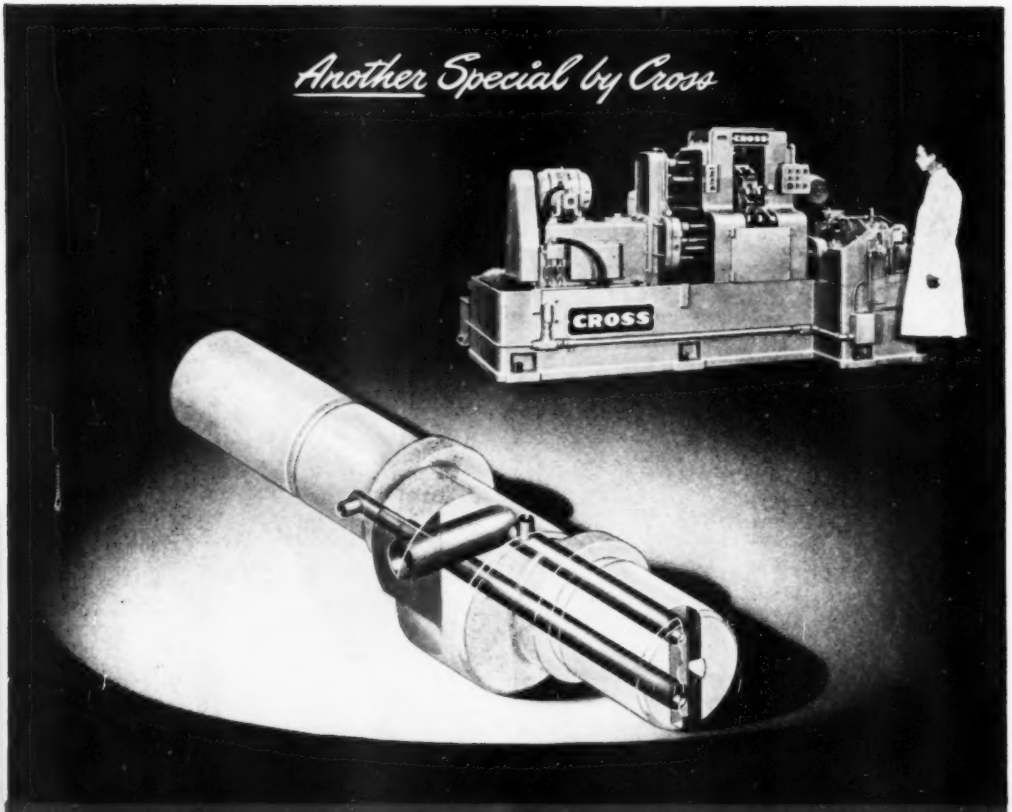
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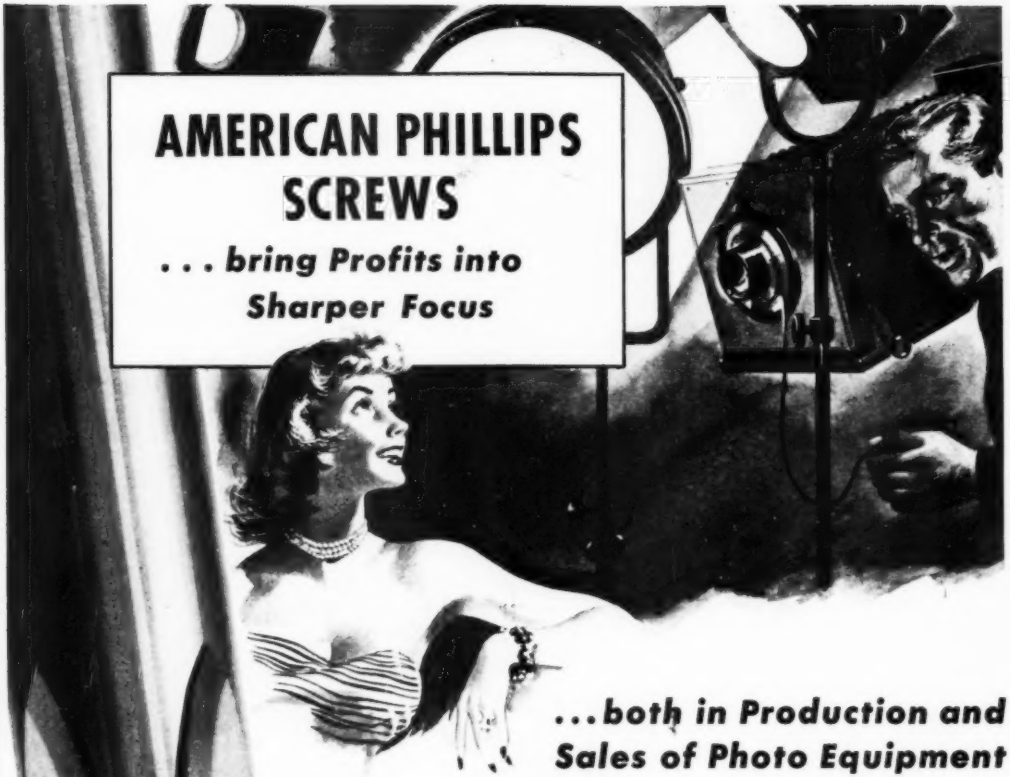
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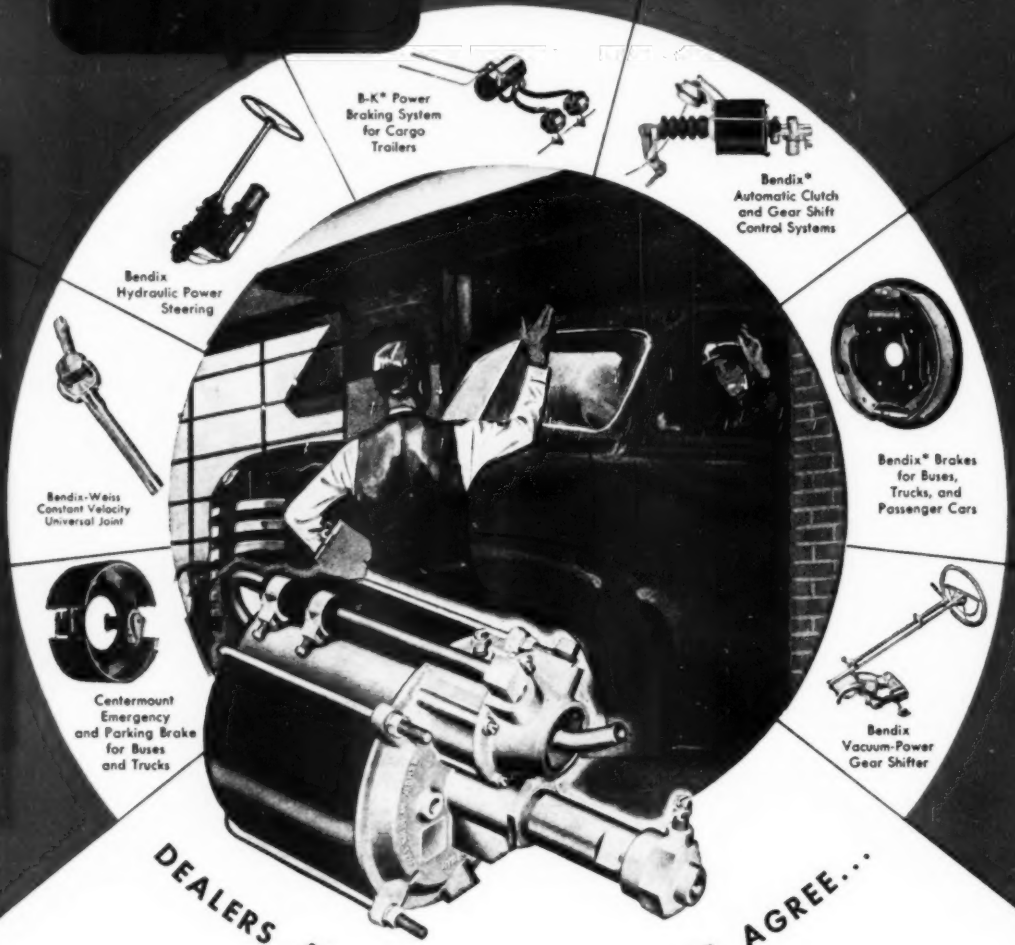
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High Spots of This Issue

Building the Power-Actuated New White Truck Cab

The forward-tilting cab on White's new 3000 series truck is of major interest in the industry. Here are described and illustrated some of the batteries of special machines used in the cab's assembly-line fabrication, page 24.

Large Scale Production of Upholstered Bus Seats

Story of how the Flxible Co. efficiently mass produces upholstered bus seats with comparatively few personnel through use of modern equipment and methods is reported in the article on page 28.

Tapered Skin Milling—A New Machining Technique

The primary consideration of weight reduction to increase aircraft performance in a competitive field receives major attention at North American Aviation, Inc., in their latest techniques of airframe construction. The article describes skillful fabrication of tapered metal sheets, permitting the mass of metal to be distributed within the sheets where it is required to carry the load. Turn to page 30.

High Compression Without High Octane Fuel—Part III

Part III in this four-part series traces the history of combustion chamber design and is extensively illustrated with diagrams of typical designs. Author Alex Taub discusses need for elimination of internal hot spots with particular reference to the high temperature of the exhaust valve. Part III begins on page 34.

Coal Burning Equipment for Gas Powered Turbines

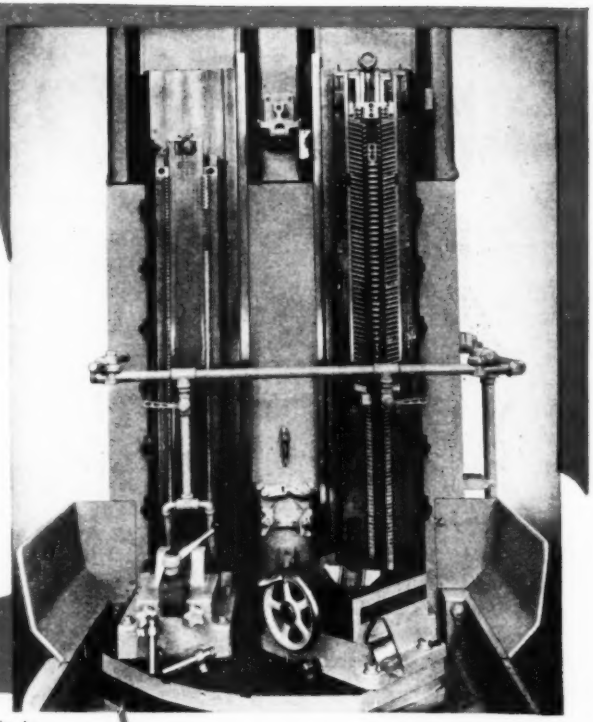
A full-scale system for the use of powdered coal in gas turbine powered locomotives has been developed, improved and completed. This latest process overcomes severe problems in coal preparation, pressurizing, combustion, and fly ash removal, as told in this interesting account, pages 44 and 45.

21 New Product Items And Other High Spots, Such As:

Valve guide bushings by simplified methods; the Tatra 87 engine, Praha, Czechoslovakia; Timken innovations; diamond-type, two-stroke, high speed Diesel engine; complete series of Diesel powered units brought out by White; the exhibit of the Mercedes-Benz Diesel car; and die-forged aluminum wheels for trailers.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

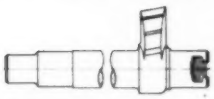
One Ram
BROACHES HALF BORES and JOINT FACES
the other
BROACHES T-SLOTS



Operation "small fry" occasionally falls heir to the low cost benefits derived from high production machines. The equipment illustrated here, another example of Cincinnati Application Engineering, shows what can be done. The machine, a CINCINNATI No. 10-66 Vertical Duplex Hydro-Broach, is normally considered a high production unit. Nevertheless, the low cost potential is realized with comparatively small quantities in this manner:

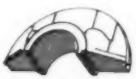
The *right-hand broaching station* is tooled up to broach a family of four main bearing caps. Joint face, bearing lock, and half bores are broached. The *left-hand station* is tooled up to broach T slots in the ends of pitman gear shafts.

Aside from broaching's high quality of finish and accuracy, other advantages derived from this setup are: One man and one machine handle several parts. Universal fixture and broach holder (right-hand station) reduce set-up time to a minimum. Production at each station may be independent, or if the material is the same, production in the two stations may be concurrent. ¶ CINCINNATI Hydro-Broach Machines and Cincinnati Application Engineering are a winning combination for your machining operations which are applicable to surface broaching. Our engineers are at your service. May we hear from you?



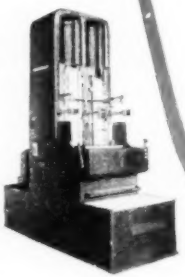
Drawing of part broached in left-hand station. Stock removal indicated in color.

Part name	Gear pitman shaft
Material	Steel drop forging
Operation	Broach T slot
Stock removal	From solid
Production	96 per hour



Drawing of part broached in right-hand station. Color indicates broached surface.

Part name	Rear bearing cap
Material	Cast iron
Operation	Broach joint face, bearing lock and half bore
Stock removal	⅛" max.
Production	96 per hour



CINCINNATI Duplex Vertical Hydro-Broach Machine. Complete specifications may be obtained by writing for catalog M-1387-2.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

NEWS of the AUTOMOTIVE INDUSTRIES

Vol. 101, No. 3 August 1, 1949

Chrysler Alters Suspension to Lower Car Height

The Chrysler Corp. has quietly lowered the overall height of its cars, primarily through modification of the suspension system. No public announcement of the change was made, but dealers were notified. It is understood that coil springs in front were shortened slightly and that the rear springs were flattened out a bit to effect the reduction of about an inch in the front and 1½ in. in the rear. Actually, according to reports, the cars when they went into production were higher than had been planned for originally, and the changes bring them more into line with the conception at the time the new models were designed. It is believed that changes were made somewhere along the line in the suspension system just before the cars were put into production, which accounted for overall height being higher than originally scheduled.

Cadillac Developing New Automatic Drive

GM's Cadillac Motor Car Div. has a new type of automatic transmission under development. Details are not yet available, but it is reported that the unit combines the best features of a torque converter and the Hydra-Matic transmission. It is believed that the new device will probably provide a much greater number of gear ratios than is now available with Hydra-Matic alone. It is still not known when the new transmission will be made available to the public, although at the moment it seems doubtful that it would be ready for introduction on 1950 models.

Name VanDerzee Sales Chief for Hudson

Succeeding the late George H. Pratt, Norman K. VanDerzee has been named vice-president in charge of sales for the Hudson Motor Car Co.

GM Sets Styling for 1952 Models

GM early in July fixed the styling of its 1952 models, about 36 months ahead of actual announcement time to the public. Complete mechanical features of the cars, of course, have not yet definitely been set.

UAW To Throw Out Cost of Living Pact

The sliding scale wage agreement currently in effect between GM and the UAW-CIO is apparently to be discarded. The union at its annual convention in Milwaukee announced that it will scrap the plan which gears hourly rates to the cost-of-living index compiled by BLS.

GM Elects Keating Vice President

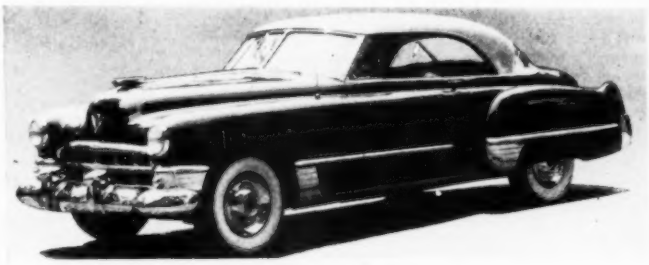
Recently named general manager of GM's Chevrolet Motor Div., Thomas H. Keating has been elected a vice-president and a member of the administration committee of General Motors Corp.

Army Awards Over $4 Million in Automotive Contracts

The Army Dept. has announced additional contracts totaling $4,002,096 for cars, trucks, and automotive parts. The contracts are as follows: GM's Chevrolet Motor Div., light sedan cars, $3,203,110, and ½ ton trucks, $349,998; Ford Motor Co., engines, $152,150; Detroit Axle Shaft Mfg. Co., shafts, $169,290; and the Kentucky Mfg. Co., four-wheel trailers, $127,548.

Car and Truck Production Breaks All-Time Record

It took 20 years to do it, but automobile and truck manufacturers finally broke the weekly production record that had stood since 1929. During the week of July 11, the industry turned out more than 148,000 units in the U. S., and 155,000 in the U. S. and Canada combined. Since there are no accurate figures available for strictly U. S. production in the week of May 4, 1929, the previous high week, it is not absolutely certain that a new weekly production record has been set for manufacturers in this country, although it seems very likely that such is the case. For a combined production in both countries, however, there is no doubt that a new weekly record has been set, since the previous record was 153,647. With the threat of a steel strike now averted for at least another 45 days, the industry is planning to continue present all-out production schedules through August and possibly into September, depending



HARD ON TOP

Styled to resemble a convertible, but with a rigid steel top, Cadillac's newest model, the Coupe De Ville, is now in production. Powered by a 160-hp engine, the car has large side window areas with the center post eliminated and a new rear window extending across the entire width of the rear top.

NEWS *of the* AUTOMOTIVE INDUSTRIES



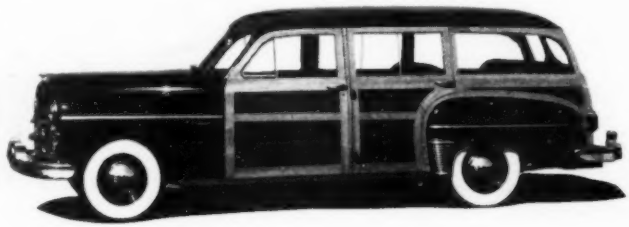
SPEARING A BUICK

The new Buick Roadmaster convertible now sports this functional sweep spear molding, available at extra cost, which starts as a triangular section just ahead of the front wheels and extends through the door panels to the end of the rear fender.

on how the market holds up. The present rush of new car business is all the more remarkable in view of the decline in other lines and the slowing up of the economy generally. The Big Three are pushing to the utmost to catch up with orders, and the independents are also hitting new highs. Studebaker and Nash report that sales for the first six months of this year were the highest in history, and Hudson was at a 20-year high. Studebaker production during the first half of this year exceeded that for any full year prior to the war. With the present production pace holding, it is now considered likely that August will set a new monthly production record for the industry and that the four millionth vehicle this year will be built some time during the month.

Buick Aiming at 10% of Market With New Special Model

GM's Buick Motor Div. is aggressively shooting for 10 per cent of the industry's total sales this year, according to Ivan L. Wiles, Buick general manager, and GM vice-president. At a press showing of the new Buick Special model, scheduled to be announced to the public Aug. 10, he said that the Division is counting heavily on the new model, smallest and lowest priced in the line, to bring sales up to the 10 per cent level. He added, however, that even if that objective is reached, it is still uncertain whether it would place Buick in third position in the industry. About 50 per cent of Buick's production in the months ahead will be devoted to the 40 Special series. The price of the Special was not available, but Mr. Wiles said that it would be priced only "moderately" above the lowest priced cars and would be competitive with most eights and many sixes. During the last several months Buick has been in fourth position in the industry with about 8.4 per cent of total sales, despite the absence of the Special, which has been out of production since last December.



A POSTWAR FIRST

This new four-door Dodge station wagon, now in production, is the first station wagon built by Dodge as a standard production model since 1938. Seating nine persons, the length of the new model is 213 in. It is in Dodge's Coronet line.

Austin and Nuffield to Stop Data Exchange

That there will be no pooling of production resources and no merger of any kind is emphasized by a statement issued simultaneously by the Austin Motor Co. and the Nuffield organization, the two biggest automobile manufacturers in England. Last year these two companies announced that they had agreed to an interchange of information on production methods, costs, design, research, etc., with the object of effecting maximum standardization and, by the pooling of all factory resources, a reduction of costs. Preliminary investigations have been completed, and although the two companies will continue to consult together through the medium of the recently formed standardization committee, the matter will end there. There will be no exchange of confidential information, nor will there be any closer get together.

Tucker Trial Date Set for Oct. 3

Preston Tucker, president of Tucker Corp., and seven other persons charged with him with violating mail fraud statutes and the Securities Act will go on trial in Federal Court in Chicago Oct. 3. Another Federal Court in Chicago has extended for six weeks the deadline for reorganization proceedings of the company on request of the trustees. The judge has set Aug 11 for submitting a plan of reorganization or filing a report that reorganization is impractical. Meanwhile 51 Tucker dealers have started action against the company to recover money paid for franchises to represent Tucker as dealers. The dealer group involved in the action asks for the return of franchise payments totaling $346,600, and in addition they are urging other Tucker dealers numbering 1750 to join them in recovery action.

Oldsmobile, Cadillac, Buick Now Building "Hardtop"

Coincident with start of production by Fisher Body of the "hardtop convertible" body, Oldsmobile, Cadillac and Buick have announced their new models of the car, each under its particular model name. Buick calls its car the Riveria and announces a price of $2985 including Dynaflow drive as standard equipment. The price also includes a

new sweep-spear side molding, push buttons for side windows, hydraulic valve lifters and backup lights, windshield washers, non-glare rear view mirror and chrome wheel disks. Oldsmobile has set a price of $2790 on its model which it calls the Holiday Coupe. The car is equipped with a Rocket engine and Hydra-Matic drive as standard equipment. It has luxurious features such as black leather trim, nylon broadcloth upholstery, hydraulic seat and window controls and other deluxe accessories. Cadillac has set a factory list price of $3290 on its Coupe De Ville. All three cars use the same basic body shell, but achieve individual styling effects through exterior elements such as fenders and grilles and interior appointments.

Car Makers & Census Bureau Agree on Data Collection

As a result of a meeting between representatives of passenger car manufacturers and the Census Bureau of the Dept. of Commerce in Detroit July 19, agreement has been reached on several points involved in filling out Form BC-31 which deals with distribution and employment at the wholesale level. The Bureau is now conducting the 1948 Census of Business and the meeting was called to clarify reporting procedures and to reach agreement with the industry on an acceptable basis for collecting data. Manufacturers wholesaling through distributors are not required to report, since the distributor will be canvassed. However, sales through parts depots are to be reported by the manufacturer by territories. Although geographical zones differ between companies, the Census Bureau asked that all reports be broken down to that level. The Census covers dollar sales of automotive products and the number of employes involved at the wholesale level. Because the necessary information is not available from all reporting sources, it was decided that sales of parts, batteries, tires, and accessories need not be broken down by individual items, but only by total. The same applies to operating expenses and credit sales.

Cadillac Reaches HP Top for Present

Cadillac has "gone about as far as is practicable" in automotive horsepower. Efforts are now concentrated on improving gasoline mileage, according to Don E. Ahrens, general sales manager, Cadillac Motor Car Div. of GM, on a recent West Coast visit. California is the nation's number one consumer of Cadillacs, taking 11 per cent of the plant's output.

Changes in Top Level Staff of Glenn L. Martin Co.

In a major reorganization of top executives of the Glenn L. Martin Co., Glenn L. Martin, formerly president, has been made chairman of the board of directors, a newly-created position. C. C. Pearson, formerly an officer of the Curtiss-Wright Corp. and Douglas Aircraft Co., Inc., has been named president, general manager and a director. Harry T. Rowland, executive vice-president and a director, and Morgan R. Schermerhorn, Jr., vice-president-controller and a director, have both resigned. Daniel A. Evatt, treasurer, has been appointed vice-president of finance; W. L. Lucas has been moved from assistant treasurer to treasurer; and Earl R. Uhlig has been advanced from assistant controller to controller.

Pontiac Plans New Building for Engineering

Pontiac Motor Div. of GM has announced plans for a new engineering building with 213,645 sq ft of working area. It will contain offices, laboratories, parking and repair garages, new model assembly, machine shop, sheet metal and paint shops, a wood shop, a complete dynamometer laboratory with engine and chassis divisions and a cold room, carburetor flow room, instrument laboratory, transmission testing, and stress laboratory. It will also contain a copper-walled radio screen room for testing radios in complete isolation from outside signals. Also included in the plans are a 700-seat auditorium and stage and a large display room for product exhibits. A drafting room and facilities for photostating and specifications are also included. No date has been set for the start of construction.

Playboy Court Hearings Set for August 10

The deadline for filing plans for the reorganization of the Playboy Motor Car Corp. has been extended to Aug. 6 by Federal Judge John Knight. He set Aug 10 for the next court hearing. Agreeing to the adjournment requested by creditors' groups, Attorney Edward H. Kavinoky, representing Trustee Allen H. Gardner, warned that the remaining assets are being depleted at the rate of $2000 a month. Mr. Kavinoky said that he intends to ask for an order at the next hearing directing the sale of at least the intangible assets. If no reorganization plan is forthcoming, he said he will seek authority to sell all of the assets.

Oldsmobile Doubles Output of New Engine Plant

GM's Oldsmobile Div. has completed doubling the production capacity of its new engine plant, and by the first of next year will move into a new final car assembly plant with a capacity of 80 cars an hour. The original capacity at the Rocket engine line has been raised to 60 an hour from the original output of 30 units. The expansion program has taken place without interruption of production through careful planning for equipment deliveries, using aisle space in certain instances temporarily, and doing rearrangement work on Sundays, holidays and at odd hours when the job could be done without interference. About 80,000 sq ft

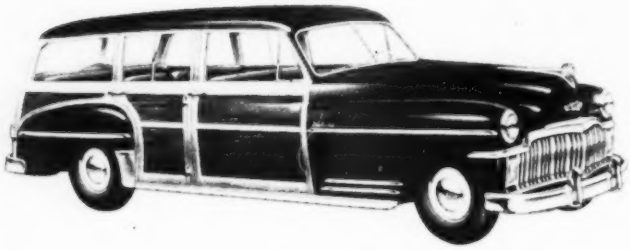


Acme

AN ELEGANT FIRST

The first prize in the "Elegance" class of the Grand Semaine (literally "Big Week") held each year in Paris was won by this svelte Delahaye with body design by Saoutchik. It was presented by Mme. Vincent Chavane.

NEWS *of the* AUTOMOTIVE INDUSTRIES



FINE FOR NINE

Now in production, this new De Soto station wagon seats nine passengers, is mounted on a 125½ in. wheelbase, and is powered by a 112-hp engine. White ash is used to frame steel door panels which are grained to resemble wood.

of work space has been added to the plant, bringing the total to 246,000 sq ft.

Station Wagon Bodies Added at Chrysler Indiana Plant

The Chrysler Corp. has started the manufacture of station wagon bodies for Dodge, DeSoto and Chrysler at its Evansville, Ind. plant. Other operations at Evansville include assembly of Plymouth cars, as well as production of chassis and body wire harness systems for all Plymouth cars.

New Crosley Roadster Doubles as Racer

The new low-slung Crosley Hotshot, powered by the Crosley CIBA (Cast Iron Block) 44-cu in. engine, weighs 1000 lb and has Hydradisc brakes, a dropped frame, low center of gravity, road clearance of 7 in. and deep aircraft-type seats. A roadster which can double as a racer, the new car incorporates combined leaf- and coil-spring rear suspension, and strut-type hydraulic shock absorbers all around. It is said to average 35 to 50 mpg. The compression ratio of the engine may be raised to as high as 12 or 14-to-1 for use with special fuel. Ordinary nonpremium fuel, however, is used in the stock roadster.

Studebaker to Modernize All Parts Warehouses

Involving the eventual modernization and enlargement of the company's entire complement of parts and accessories warehouses, a building program has been announced by the Studebaker Corp. Six new parts depots have already been completed and are in operation, and five are under construction. Work on other units will be started as soon as possible.

Int'l Harvester Building $1 Million Parts Depot

A wholesale parts depot costing about $1 million will be built in South Memphis, Tenn., for the International Harvester Co. The one-story building, to be completed next spring, will include about 138,000 sq ft of floor space.

Willys Ships Knock-Downs to Mexico for Assembly

Willys-Overland has completed arrangements for shipping its vehicles into Mexico in knocked-down form for reassembly there. The new system is established to meet requirements of the Mexican government which early in June imposed new stringent import regulations to restrict the flow of commodities into Mexico in order to conserve dollar balances.

GM Starts Construction of Technical Center

GM has started construction of its multi-million dollar technical center to be located on a 320-acre site northeast of Detroit. Ground has been broken for the engineering buildings which are expected to be ready for use in a little more than a year. Work on the research laboratories building will be started a little later this year.

New Overhead Valve Six Under Development

One of the Big Three has under development a new overhead valve six-cyl, in-line engine that is reported to be giving outstanding results under performance tests. The company is currently using only L-head engines, and the switch to overhead valve indicates a trend toward higher compressions. The engine is considerably smaller than the current type, being only about 170 cu in. displacement. It is doubtful, however, whether the engine will be used in either the car or truck line before 1952.



PORTRAIT OF A HOTSHOT

Powel Crosley, Jr., president, Crosley Motors, Inc., is shown introducing the company's latest model, a roadster called the Hotshot. Delivering anywhere in the U. S. for less than $1000, the car can be converted into a racer by removing the all-weather cloth top, bumper, windshield and lights.

NEWS *of the* AUTOMOTIVE INDUSTRIES

General Motors Plans to Sell "Train of Tomorrow"

GM is planning to sell its "Train of Tomorrow" after the Chicago Railroad Fair, where it is now on display, ends Oct. 2. In the two years since the train was built, at an estimated cost of more than $1 million, the train has been shown in 169 cities in the U. S. and Canada.

Fairchild Appoints New Chairman & President

James A. Allis, vice-president of the Grace National Bank in New York, has been elected chairman of the board of the Fairchild Engine and Airplane Corp. Richard S. Boutelle, formerly vice-president and general manager, has been named president. Among the other new officers are: Arthur F. Flood, vice-president, controller, and treasurer; and Myron B. Gordon, T. A. Sims, and George F. Chapline, vice-presidents.

British Car Sales Up in U. S. & Canada

Despite recent reports that British automobile sales are declining in the U. S. and Canada, Sir William Welsh, North American representative of the Society of Motor Manufacturers and Traders states that sales of British cars in both the U. S. and Canada have shown a substantial increase during the first five months of 1949, in comparison with the same period a year ago. He said that, actually, a total of 3881 British cars were sold in the U. S. from January through May of this year—an increase of 510 over the 3371 sold during the same period in 1948, while the demand in Canada far exceeds the supply of British cars available.

Name Crews Manager of L-M Central Region

Following the recent regrouping of Ford's Lincoln-Mercury Div. sales districts into four regions, it has been announced that Norman E. Crews has been named regional manager of the Central Region. An Eastern regional manager is to be announced later.

Peugeot Now Controls Hotchkiss

The Hotchkiss Automobile Co., Paris, has gone under Peugeot control, and from now on will cease to exist as in independent unit. Hotchkiss dates back to 1870, having been founded by an American citizen who came to France to manufacture guns in the war against Germany. The automobile section was added in 1903, and the gun factory was nationalized and separated from automobile production a few years ago. Under Peugeot control, the Hotchkiss factory will produce a sedan designed by J. J. Gregoire. This car has a flat four-cyl engine of 122 cu in. piston displacement with front wheel drive, independent suspension all around, and a four speed transmission with overdrive. It has a total weight of 2300 lb, a speed of 85 mph and a gasoline consumption of 28 mpg. All existing Hotchkiss models will be dropped. The new car is not expected to be on the market before the middle of 1950, and will be marketed and serviced through Peugeot dealers.

Renault to Produce in England

Renault, the French nationalized automobile factory, has secured permission from the Board of Trade to manufacture in England. Rear-engined passenger cars and light trucks will be assembled in the London plant. The major parts will be imported from France. One of the conditions of the British permit is that 75 per cent of the passenger cars and 55 per cent of the trucks shall be exported. Passenger car production is now better than 300 a day.

Ford Moving Parts Depot from Kansas City Plant

Because of increased pressure for manufacturing space and inadequate facilities to accommodate heavier parts business at the Ford-Kansas City assembly plant, the company will move its parts depot, now located in the plant, to a new leased building in North Kansas City. The transfer of operations will probably take place in September. The new facility will provide more than 60,000 sq ft of floor space, with an additional 9000 ft of adjoining property. The separate parts depot will service the entire Kansas City Ford district, now supplied by Kansas City and Omaha.



AND ONE MAKES NINE

This new Plymouth two-door sedan is now in production, adding a new five passenger sedan to the other eight models in the new Plymouth line. Powered by the same 97-hp engine as the other Plymouth models, the new car has a retail price at factory, Detroit, Mich., of $1410.

Chrysler Div. Head Predicts Car Shortage Until 1951

Two more years of continued heavy production will be necessary to bring the total number of postwar cars on the road up to the level necessary to bring about a cycle of supply and demand such as prevailed before the war, according to D. A. Wallace, president of the Chrysler Sales Div. of the Chrysler Corp. He said that some prospective customers will not be able to get delivery of new cars until 1951, and that between 30 and 35 million postwar cars will have to be on the road before a normal automobile market is re-established. He added that it would probably take four years to get the number of prewar cars on the road down to the level of one million.

Federal-Mogul Acquires National Formetal

Federal-Mogul Corp., Detroit, has acquired the National Formetal Co. of Cleveland and will operate it as a divi-

sion of Federal Mogul. No change in personnel is contemplated. Robert Morris, former president of National Formetal, will remain as general manager of the division and Benjamin S. Gersen, likewise a former officer, will continue as sales manager. Arthur E. DeKome remains as works manager and in charge of engineering, and A. J. Jacobson continues as assistant to the general manager at the Cleveland plant.

Packard Promotes Carr to Head of Service

J. A. Carr has been promoted to manager of the parts and service department of Packard. He succeeds E. D. Longnecker who resigned to take a similar position with the Lincoln-Mercury Div. of the Ford Motor Co.

NADA Sees More Trading by New Car Dealers

By next year three used cars may be involved in each new car sale, according to a prediction by NADA. Before the war most new car sales required the handling of two used car deals. NADA reports that a Federal Reserve Board survey shows that 1.8 used cars were sold or traded for every new car sale last year, compared with about 1.6 in 1927. It points out that dealers will consequently have to do a far greater volume of used car reconditioning, financing, and selling during the next few years than they have done since prewar days.

Delco Founders Honored at Dayton Ceremonies

Charles F. Kettering, former director of GM Research and now retired, and others who worked with him in founding the old Dayton Engineering Laboratories Co. were honored at ceremonies July 22 held at Dayton, O. Sharing honors with Mr. Kettering were cofounder Colonel E. A. Deeds, William A. Chryst, and surviving shop helpers who at one time or another worked in the old barn loft in Dayton in the early days of the company. Col. Deeds is board chairman of the National Cash Register Co. and Mr. Chryst is now retired after serving as Delco Products chief engineer. C. E. Wilson, GM president who headed Delco in 1927-28, former Delco general managers, and other executives who once served in the Delco organization were also present. The original company was incorporated July 22, 1909, and has since been reorganized into four GM manufacturing divisions under the Delco trade name. They are Delco Products, Delco-Remy, Delco Radio and Delco Appliance Divisions. Mr. Kettering left Delco in 1920 to organize GM Research Corp., later to be known as GM Research Laboratories Div. and headed the organization until his retirement June 2, 1947.

Rolls Royce Producing Diesels

Rolls Royce is now in production on a set of eight-cyl, V-type Diesels having a piston displacement of 1098 cu in. and developing 250 hp at 2000 rpm. These are to be fitted in a special six-wheel Thorneycroft tractor chassis hauling Crane semi-trailers, and the gross weight of each unit will be from 60 to 80 tons. The vehicles have been ordered by the Iraq Petroleum Co. for pipe transportation in the construction of new pipe lines in Iraq.

Pratt & Whitney Turbo Wasp Commercially Available

Now available for commercial use, the JT-6B Turbo-Wasp, a 5000-lb thrust jet engine is included for the first time on Pratt & Whitney Aircraft's list of current unrestricted production engines. The engine is a Pratt & Whitney Aircraft development of the British Rolls-Royce Nene turbojet engine design.

British Export Two Thirds of Automobile Output

The 1949 edition of *Automobile Facts & Figures*, published by the Automobile Manufacturers Association, and soon to be released, shows that of the 3,909,270 passenger cars built in the U. S. last year only 217,911 units, or six per cent were exported, leaving 94 per cent for home consumption. Great Britain on the other hand exported 68 per cent of its total production of 334,820 passenger cars last year, or 226,911 units. Consequently, people in Britain last year were able to buy only 107,909 passenger cars compared with nearly 3.7 million for purchasers in this country. The statistical year book also shows that world production last year totaled 6,436,000 units of which 4,605,800 were passenger cars. Canada was third in world production with 166,819 cars, followed by France with 100,000, and Italy with 44,220. World motor vehicle registrations now stand at 58 million with more than 41 million of them in the United States. The AMA also points out that the U. S. now has one motor vehicle for every 3.5 persons, whereas Great Britain has one for every 18 persons, Poland one for every 347 persons, and Yugoslavia one for every 4425 persons.

Chevrolet to Use Truck Engine with Torque Converter

It is reliably reported that Chevrolet will use its truck engine, possibly with slight modifications, in 1950 models equipped with torque converters which will be available as optional equipment at extra cost.

NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the Five Months' Totals

MAKE	May 1949	April 1949	May 1948	FIVE MONTHS Units 1949	Units 1948	Per Cent of Total 1949	Per Cent of Total 1948
Chevrolet	104,542	76,637	53,896	324,015	300,046	18.74	21.08
Ford	60,454	67,212	8,056	305,497	159,871	17.67	11.24
Plymouth	40,909	49,473	25,906	184,643	142,614	10.68	10.01
Buick	35,824	28,666	19,043	145,348	106,665	8.41	7.50
Pontiac	31,178	24,672	17,861	108,947	100,094	6.30	7.04
Oldsmobile	25,403	20,325	14,711	96,281	76,917	5.57	5.41
Dodge	19,610	14,580	17,143	83,251	94,887	4.81	6.67
Studebaker	19,626	16,087	12,121	69,947	59,668	4.05	4.19
Mercury	17,281	17,248	8,257	66,852	40,052	3.87	2.82
Hudson	15,095	12,595	10,794	62,083	47,322	3.59	3.33
Nash	12,152	12,599	11,207	51,948	51,046	3.00	3.59
Chrysler	10,918	10,948	9,377	47,252	45,695	2.73	3.21
Packard	9,367	8,553	8,464	38,388	30,152	2.22	2.12
De Soto	8,734	7,784	7,011	37,927	35,212	2.19	2.48
Cadillac	7,714	7,034	5,763	33,212	22,014	1.92	1.55
Kaiser	7,883	6,009	10,822	23,386	44,680	1.35	3.14
Lincoln	4,061	3,392	2,967	17,426	8,297	1.01	.58
Willys	2,941	2,525	2,485	10,933	12,180	.63	.86
Frazer	1,983	1,987	7,216	9,737	29,288	.56	2.06
Crosley	970	1,020	2,944	5,281	10,747	.31	.76
British Ford	630	618	100	3,002	101	.17	.01
Austin	335	244	953	1,226	3,576	.07	.25
All Others	641	321	551	2,580	1,477	.15	.10
Total	446,251	390,932	255,639	1,729,146	1,422,802	100.00	100.00

* Data from R. L. Polk & Co.

NEWS *of the* AUTOMOTIVE INDUSTRIES



A STERLING LIGHTWEIGHT

Available with either gasoline or Diesel engines, and mounted on a 143-in. wheelbase, a new lightweight tractor series for highway hauling has been announced by the Sterling Motors Corp., Milwaukee, Wisc.

Chevrolet Names Two New Plant Managers

GM's Chevrolet Motor Div. has announced two changes in personnel in its plant management organization. William L. Mosher, Jr. has been made plant manager of the Chevrolet-Kansas City Div. to succeed R. R. Lynes who died recently. Carl C. Wood has been appointed plant manager of the Saginaw Grey Iron Div. He succeeds James F. Miller retired.

Motor Products Building New Plant in Ohio

Motor Products Corp., Detroit, has contracted for the construction of a new plant at Marion, O. to be called the Marion Industries Div. The new facilities will include a manufacturing and assembly plant, power house, and office building and will occupy a 40-acre site. The new plant will provide additional facilities for production and permit the diversification and development of products on which engineering and research work have been in progress for some time.

Specialize Output of Fiat and Alfa Romeo

It has been decided that the Italian Government should support conversion of the Alfa Romeo organization for the output of mass production de luxe cars while the output of trucks should be left to Fiat of Turin and O.M. of Brescia. Alfa Romeo will specialize in the output of a new type of six-passenger car with 97.6 cu in. piston displacement, to be produced in 1950. Fiat is reported to have taken up the contract between the Cisitalia Co. and the Argentine Government, and has negotiated an order for buses with the Chilean Government.

Ships to Haul Trucks & Cars Along California Coast

A new type of ship will haul 186 fully loaded 30-ft truck-trailers overnight between Los Angeles and San Francisco. The Maritime Commission has approved construction of two 18,000 ton vessels. The ships will be 563 ft long with entry through the ship's side, a design of interest to the Navy. Geared to a speed of 25 knots, the vessels will make the Los Angeles-San Francisco 450-mi run overnight. Daily trips are scheduled, and the ships will also carry 348 passengers and 46 passenger cars.

1948 Truck Taxes Over $1 Billion

In 1948 for the first time in history, special truck taxes soared past the billion dollar mark nearly equaling the total of all special motor vehicle taxes for the year 1933. According to *Automobile Facts & Figures*, statistical year book published by the Automobile Manufacturers Association, special taxes per motor truck last year averaged $150.66 against $142.37 in 1947. Truck taxes last year accounted for nearly one-third the all-time record high tax bill of nearly $3½ billion paid by American motorists in 1948, the year book states, although trucks comprised less than 18 per cent of total motor vehicle registrations. The $3½ billion represents an increase of more than 12 per cent over the previous year. In addition, motorists paid $239 million in general state sales taxes on automotive products.

Another interesting fact is that 28 per cent of tax revenues of all the states last year was derived from special taxes on motor vehicles. Local, state, and federal special taxes includ-

(*Turn to page 64, please*)

NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the Five Months' Totals

MAKE	May 1949	April 1949	May 1948	FIVE MONTHS Units 1949	Units 1948	Per Cent of Total 1949	Per Cent of Total 1948
Chevrolet	32,882	28,864	26,276	141,951	128,318	36.74	28.69
Ford	16,446	14,725	26,034	69,125	97,157	17.89	21.72
Dodge	10,766	9,601	11,110	47,784	51,330	12.37	11.47
International	7,487	7,351	12,106	38,116	58,630	9.87	13.10
G. M. C.	7,570	6,843	5,916	31,708	28,914	8.21	6.46
Studebaker	5,209	4,591	3,120	23,279	20,547	6.03	4.59
Willys-Truck	1,628	1,603	2,940	10,023	10,077	2.59	2.25
Willys-Jeep	1,114	1,723	4,795	7,510	21,182	1.94	4.73
White	655	719	1,111	3,548	5,371	.92	1.21
Mack	529	507	963	2,961	4,712	.66	1.05
Diamond-T	451	509	1,028	2,548	4,715	.66	1.05
Reo	346	366	1,135	1,918	5,331	.50	1.19
Divco	378	334	635	1,566	2,716	.40	.61
Autocar	131	166	243	838	1,272	.22	.28
Brockway	113	141	235	676	1,480	.18	.33
Federal	148	127	488	653	2,282	.17	.51
Crosley	101	79	295	504	1,188	.13	.27
F. W. D.	29	36	39	179	378	.05	.08
Kenworth	22	40	55	164	178	.04	.04
Pontiac	86	58	...	164	...	.04	...
Sterling	17	19	36	89	220	.02	.05
All Others	267	255	184	1,449	1,402	.37	.32
Total	86,375	78,857	100,614	386,357	447,400	100.00	100.00

* Data from R. L. Polk & Co.

By Joseph Geschelin

Building the

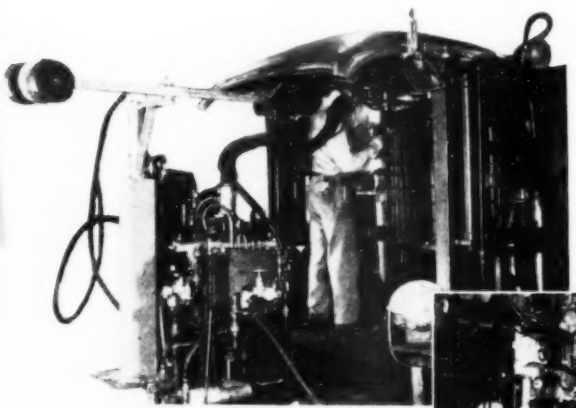
THE birth of an advanced type of COE truck—the White 3000 Series with its unique power-actuated cab—was recorded in AUTOMOTIVE INDUSTRIES, May 1, 1949. This article gives some selected highlights of how the cab is built by the White Motor Co.

Fabrication of the cab as well as chassis assembly, painting, and final assembly and testing have been divorced from main plant operations and are concentrated in a separate manufacturing department. The cab is fabricated in a self-contained area where the company has installed the latest type of pressure gun spot welding equipment; and has provided a variety of framing jigs for handling major sub-assemblies; as well as portable framing fixtures for maintaining size and alignment of door openings and windshield opening on the mechanized welding line.

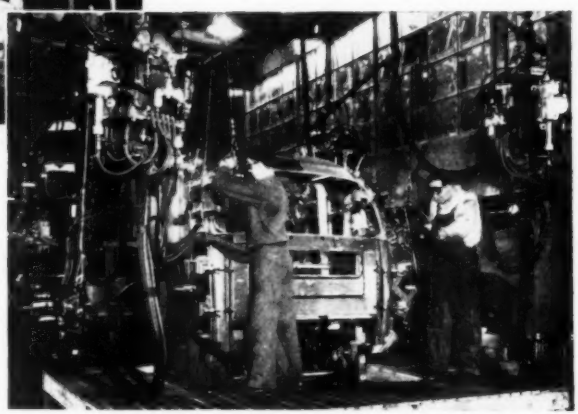
The cab department has a battery of 20 of the latest type Progressive welding guns of various types with portable transformers and built-in hydraulic pressure boosters. Mounted overhead—and out of the way—is a battery of Weltronic, electronic control cabinets, one for each welding gun. These cabinets are responsible for the precise and automatic control of certain major functions of welding gun operations, such as—temperature, time cycle, pressure, etc. In addition, there are several Sciaky resistance welders, and one Federal resistance welder fitted with fixtures for welding two doors at a time.

Combing to cab fabrication, minor sub-assemblies are built up from component stampings and tack welded in the Sciaky machines. The major sub-assembly, consisting of the floor structure and inner cab framing members, is assembled in the massive framing jig illustrated here, and is then transferred to the finish welding and metal finishing conveyor line. At a point several stations along this line is another of the big framing jigs, this one designed to produce the outer shell structure of the cab. It is located to one side of the line. When the outer shell is welded together into an integral unit, it is transferred to the welding line for installation over the inner framing.

Several interesting features of the outer shell welding machine may be seen in the illustration. The first of these is the unique arrangement for mounting the welding gun. As shown, it is pivoted in universal fashion from a pedestal mounted outside the fixture. This facilitates reaching all parts of the sub-assembly, relieving the operator of



This is the major framing jig in the cab welding department. Sub-assemblies prepared in the background, together with other component parts, are placed in the jig, aligned accurately, and welded together by means of the various Progressive gun welders seen overhead.



The large framing jig, seen in this view, prepares the sub-assembly of the outer skin panel of the cab. Distinctive features of this machine are the specially mounted welding gun for reaching into the fixture and the Bendix-Westinghouse diaphragm type clamps.

Power-Actuated Cab

for White's New 3000 Series Trucks

most of the manual work usually involved in a job of this character.

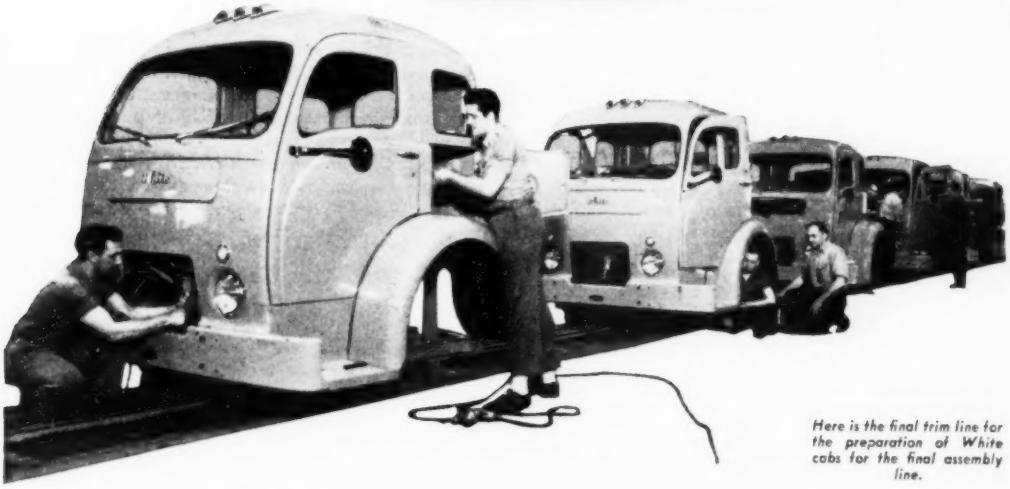
Another feature of the fixture is marked by the adoption of the well-known Bendix-Westinghouse air diaphragm assembly for clamping. A large number of these units are mounted about the fixture at clamping points, all controlled from a single station.

When the cab-in-white has completed its course on the metal finishing line, it proceeds to a compact and well organized Bonderizing and painting line in the adjoining bay. The first step in Bonderizing. Here the cabs are transported through the large five-stage Bonderizing unit where they are washed, rinsed, Bonderized, rinsed, chromic acid sprayed, and cold rinsed. Upon emerging from this unit, the cabs continue, first through a Fostoria infra-red tunnel for dry-off, then to the several stages of paint and drying.

For the latter operations, there is an R. C. Mahon, water back, double-canopy paint spray booth for the prime coat, followed by drying in a Fostoria infra-red tunnel. This is followed by spraying the color coat in the second Mahon booth and drying in another infra-

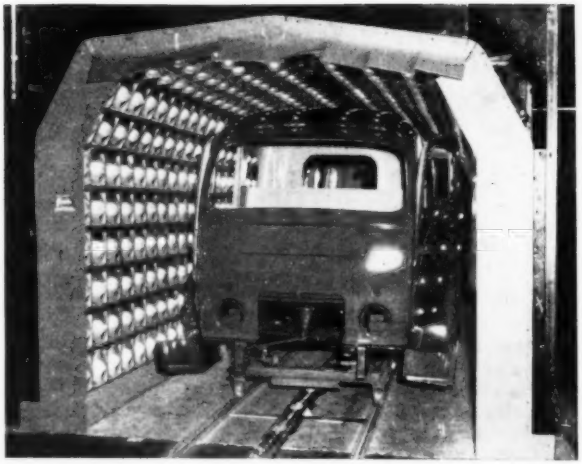


Installation of the cab on the chassis. The unusually massive cradle employed here permits the tilting of the cab and holding it in position to facilitate its mounting at the front end and attachment with the power operating mechanism.

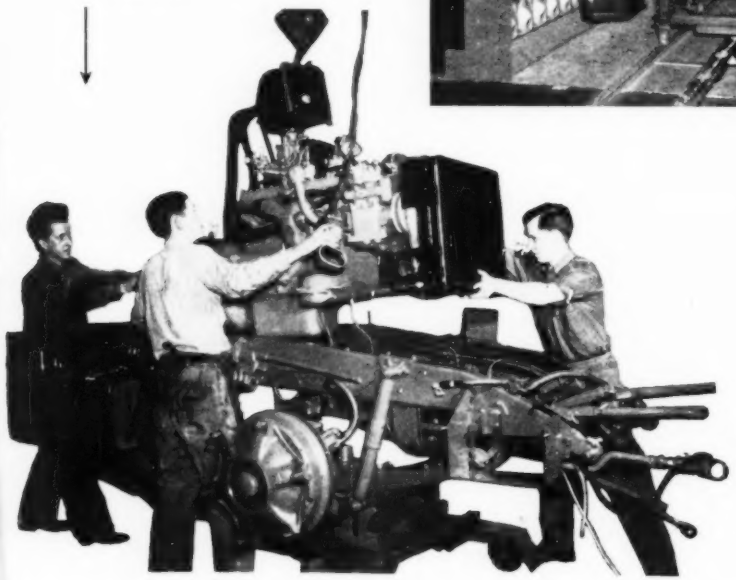


Here is the final trim line for the preparation of White cabs for the final assembly line.

One of the many Fostoria infra-red drying tunnels installed by White, this one showing cabs being baked after painting. The cycle through this tunnel is about nine minutes.



View on the Series 3000 assembly line, illustrating the installation of the powerplant. It will be noted that this is a complete unit consisting of the engine and transmission assembly together with the radiator.



red tunnel. The painted cabs then are ready for transport to the trim line and final assembly.

It may be noted at this point that White has had considerable experience with infra-red tunnel ovens. They installed several large tunnels during the war and have expanded these installations since. At the present writing they have a total of 11 Fostoria infra-red tunnels on sheet metal paint lines and on the chassis lines. In the new department described here the conveyor is timed to take nine minutes for drying in the tunnels.

Generally speaking the "3000" chassis assembly procedure is laid out along conventional lines, although the illustrations will emphasize new features incident to the unique design of this vehicle. One example is the engine drop, as illustrated. Here it includes the entire power plant and radiator assembly as a unit.

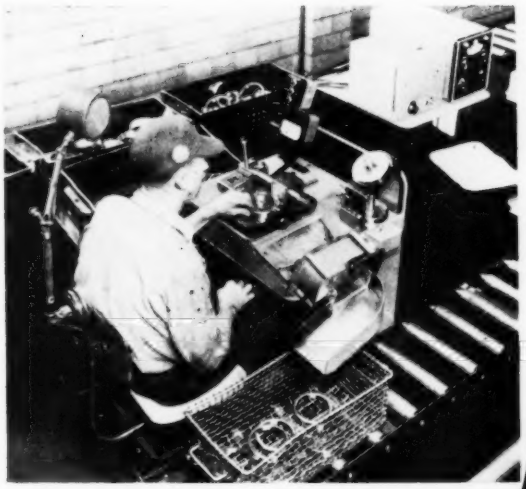
Naturally the distinctive feature on the final assembly line is the installation of the cab. Since the cab is pivoted at the front end of the chassis frame and requires assembly with the operating mechanism, cab assembly installation is decidedly different. The cab is transported to the final assembly line by hoist while cradled in the massive fixture shown in the photograph. Suspended in this position, the cab is so held as to facilitate its mounting and attachment to the actuator mechanism.

Mercedes-Benz Exhibits Diesel Passenger Car

At the West-German Export Fair held in Hanover recently the Mercedes-Benz firm exhibited a passenger car equipped with a four-cylinder Diesel engine of 2.89 in. bore by 3.93 in. stroke (103.5 cu in.). The engine is of the Mercedes precombustion-chamber type and develops 38 hp at 3200 rpm. It is built into a chassis which is normally equipped with a four-cylinder gasoline engine of about the same displacement and output, and the maximum sustained speed on the Autobahn is said to be about the same as with the gasoline-engined car, 62 mph. The advantage of the Diesel-equipped car is that its mileage on a gallon of Diesel fuel is 36, as compared with 24 miles per gallon of gasoline where that fuel is used. Mercedes-Benz claims to have been the first firm to offer a Diesel-equipped passenger car, in 1936. In addition to the Diesel-engined model the firm showed

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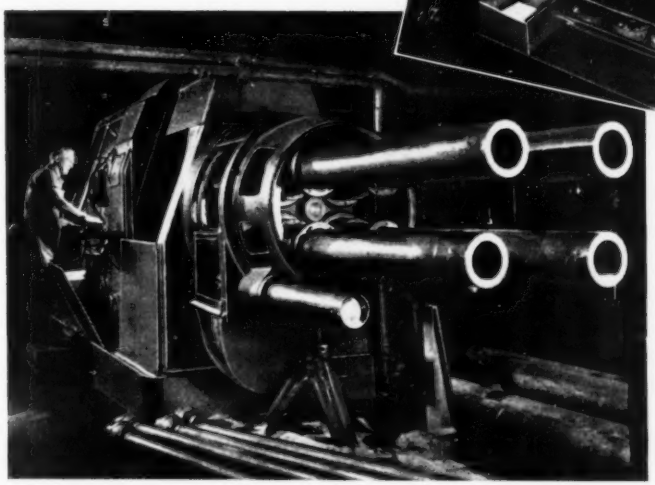
Timken Innovations



Timken has found it feasible to employ handicapped workers on many operations. Here is a blind operator inspecting bearing races by means of an electronic sound-gaging device developed by the company.



Taper rollers for Timken bearings are sized automatically in the specially-designed automatic inspection machine shown here.



Timken operates one of the largest screw machine departments found in the industry. This is a close-up of an enormous 8-in., four-spindle screw machine which is said to be the largest in use anywhere. It produces bearing cups from Timken seamless steel tubing.

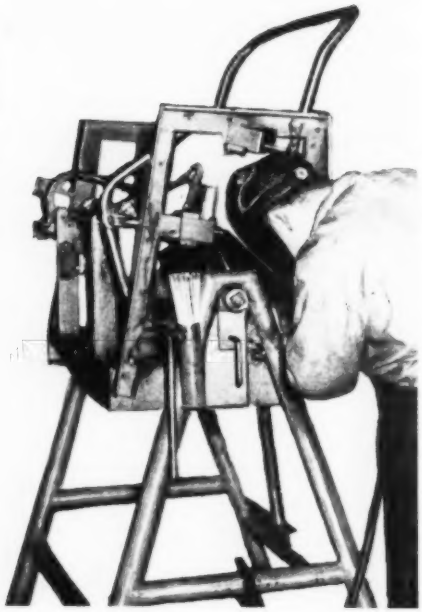
Large Scale Production of Upholstered Bus Seats

By Walter Rudolph



Seat risers are held in a special jig while they are trimmed with aluminum molding.

Tubing is welded in jigs which hold the work by means of locating pins and clamps.



EFFICIENT mass production of upholstered bus seats is possible at the Flxible Co., Millersburg, Ohio, with comparatively few personnel through the use of modern equipment and methods. This firm has had a quarter-century experience and in the automotive transportation field, producing funeral cars, ambulances and a luxury Land Cruiser in addition to buses.

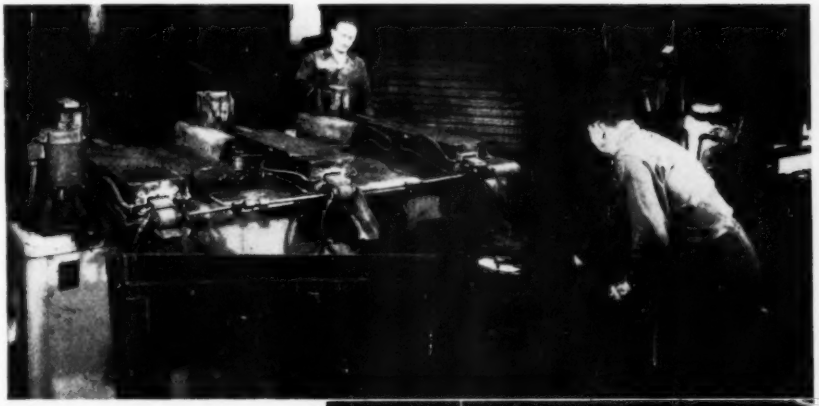
Maple, oak, and plywood are used in the construction of cushion frames for seats and backs in some upholstering. Wood is commonly received at the plant in sections or planks, 10 ft by 10 in. by 2 in., and ripped into strips. Pieces with highest quality exposed surfaces are set aside for seat pieces that will show in use. Ripped strips of wood go to the shaper and jointer for working to dimension in the woodworking department, and are stacked for moving to the framing benches.

Jigs for frame assembly are fabricated by Flxible's own toolmakers. One man does partial assembly in the frame jig, for instance, and hands the assembly to a co-worker for completion of the job. Portable electric drills and screw drivers are employed for operations while work pieces are in the jigs.

Coil springs for inside seat cushion frames are held in the frames by steel straps, processed through punch presses so that the end of a spring hooks into a strap hole.

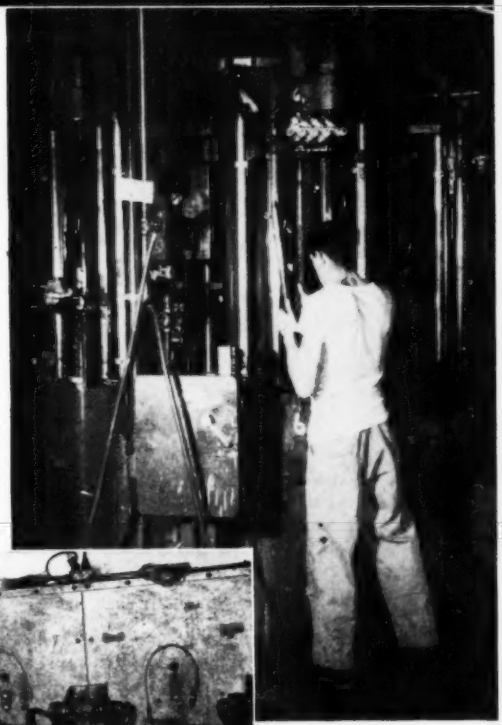
The frame with strapped springs next goes to the upholstering department, where foam rubber cushioning about 5½ in. thick is cemented into place. Transportation mohair is next tacked over the whole with a magnet hammer. From four to six colors are used. Stapling hammers are used over the assembly to complete the work, and the cushion is ready for the

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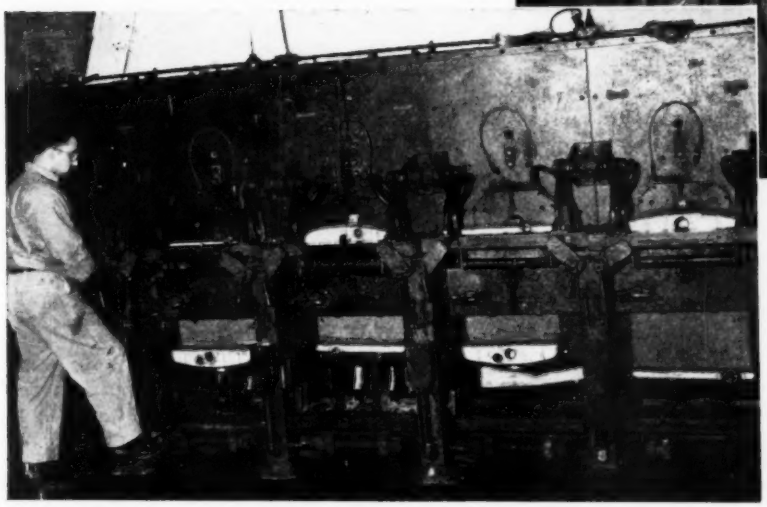


Scale is said to be reduced to less than 0.001 in. by induction heating of tractor track link forgings at Willys-Overland's commercial forge plant. Blocking dies have averaged 35,000 parts and finishing dies 18,500 parts. A billet, heated to 2325 F, is automatically ejected to the pressman every 10.7 seconds.

High Speed Heating Machines



(Above) This special Inductomatic machine, powered by two 125 kw, 10,000 cycle TOCCO units, surface hardens 120 axle shafts per hour at the Salisbury Axle Plant of the Dana Corp. Induction heating permitted a change from SAE 4140 to SAE 1033 steel.



(Left) Radiator tanks are soldered to cores by induction heating at International Harvester Co. Automatic controls hold temperature of work at 400 F.

Taper

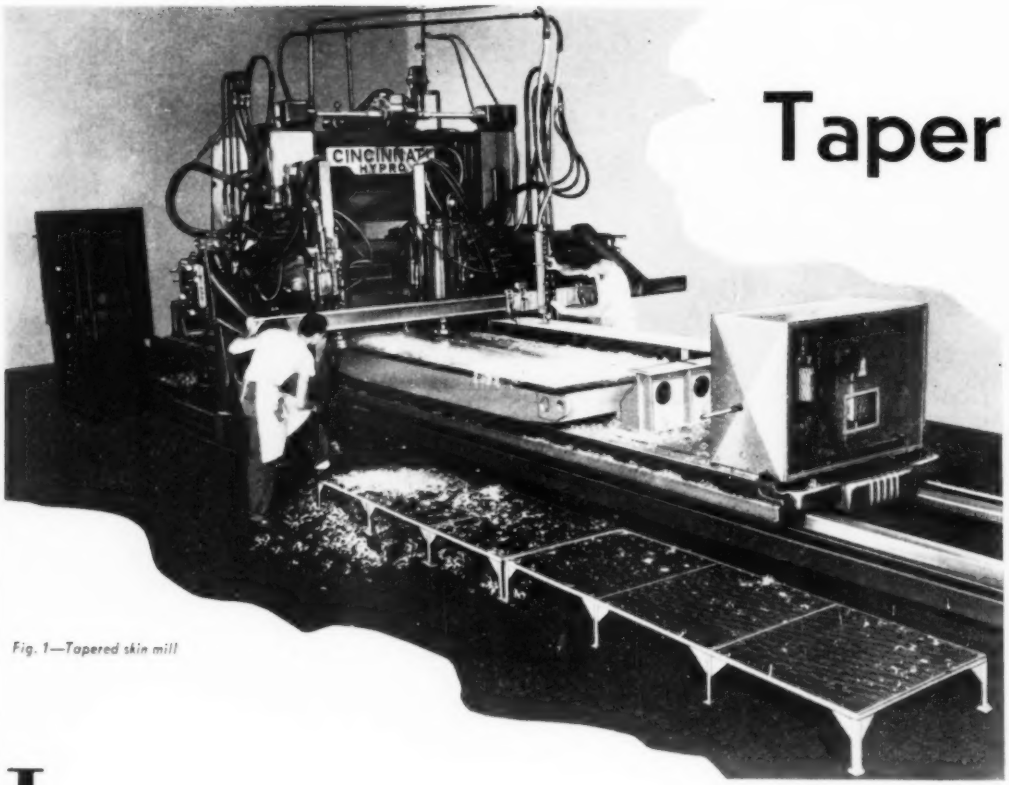


Fig. 1—Tapered skin mill

In the constant competition to increase aircraft performance the reduction of weight is of primary interest. Among the latest techniques in airframe construction is North American Aviation's fabrication of tapered metal sheets which save weight by distributing the mass of metal where it is required to carry the load.

Fig. 2 shows a typical tapered wing skin produced by milling on a modified planer, Fig. 1. The work piece is held flat against a hold-down plate by air pressure and suitable clamps, which is in turn supported on the carriage of the machine. Milling is accomplished by traversing the carriage and its load lengthwise against the revolving cutter. Or, the carriage may remain stationary and the milling head move on its own bridge crosswise to the length of the piece. Angular cuts also may be made by pacing the speed of the carriage movement to the crosswise travel of the milling head. Depth of cut is adjusted only when the machine is not in operation.

The type of tapering produced is a result of positioning the hold-down plate, either flat for step-milling, or tipped at an angle for uniform tapering. Short uniform tapers, 12 in. maximum length (Type B, Fig. 3) can be produced in conjunction with step-milling, without tipping the plate by tilting the milling head on its bridge. It is in the design of the type of taper that the greatest economies in tapered sheet milling can be effected.

For the present, the minimum size accommodated by the hold-down plate is 48 in. by 130 in. and the maximum thickness and width which can be held flat by the machine is 0.625 in. by 48 in. The maximum length of sheet which will fit in the machine is 20 ft, and although 130 in. is the maximum length of cut which may be taken, the piece may be shifted on the hold-down plate. Minimum thickness after milling is 0.020 in. The tolerance on thickness after milling is $\pm$ 0.005 in.

Insofar as it may be possible, the design of the tapered skin should be laid out with straight cuts parallel to or at 90 deg to machine bed traverse. Obviously this will simplify machining and, therefore, it may be more cheaply done. However, profile cuts and angular cuts are guided by template and stylus, and, with infinitely variable speed ratio between cross travel and lengthwise travel, a cut in any direction may be made. The blending of cuts is the most difficult operation in tapered skin milling. Certain types of internal corner cuts are attainable only with extreme care and skillful manipulation of the controls. Especially difficult is the blending of two plane cuts. The preferred design is the blending of two radii or,

By A. C. Slatter
and J. J. Sloan
Production Design Engineers,
North American Aviation, Inc.

Skin Milling—

a New Machining Technique

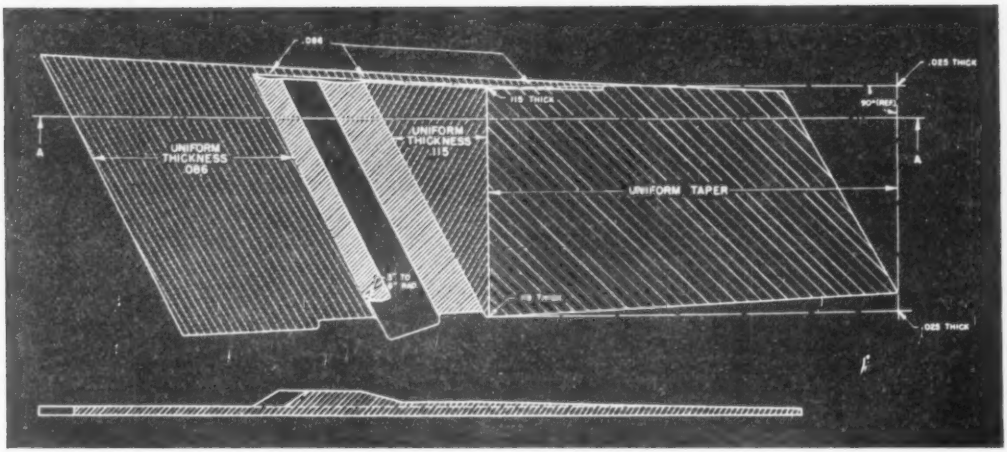


Fig. 2—Typical taper-milled wing skin

as in Fig. 4, a radius and a plane cut.

The cutter radius adopted as most suitable is ½ in. and cutters are very accurately ground to this radius. Although other radii could be used a uniform radius is desirable to limit the number of set-ups required.

Fig. 4 also shows three to six in. radius at the inside corner, the diameter of the circle described by the fly-cutter. Smaller diameters require more passes over a given area to remove material. Diameters larger than 12 in. are at present impractical because of deflection of the cutter and difficulty in blending machined surfaces.

In fabricating a machined sheet which is stepped down in areas of uniform thickness the hold-down table is flat and level, and the stepped areas are connected by, preferably, cuts of ½ in. radius, or short lengths of uniform taper as in type B, Fig. 2. A uniform system of dimensioning of these cuts has been devised. Fig. 5 shows correct and incorrect methods of dimensioning. The thickness tolerances under which aluminum sheet or plate stock is received from the manufacturer vary enough to make it difficult to hold

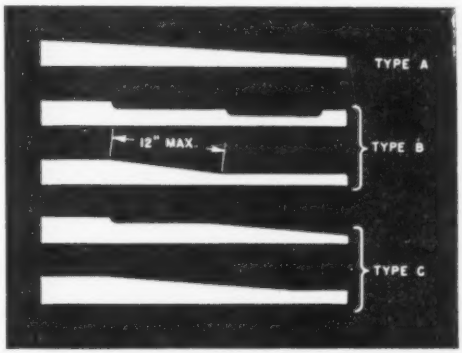


Fig. 3—Types of tapered sheets. In general, tapered sheets fall into three groups. A. Thickness tapered uniformly from end to end, produced by machining or by rolling. To date, rolled tapered sheets have been made only experimentally. B. Thickness reduced in steps of uniform thickness by machining only. C. Combination of A and B. Machining of types A or B can usually be done in single set-up of the hold-down plate but type C may require two or more setups.

improperly applied dimensions. The line of tangency (of the cutter radius) nearest the hold-down plate is preferred.

Because of the nature of the flycutting tool, machined sheets should not be designed with a thick section completely surrounding a recessed area. The flycutter cannot be lowered into the sheet to make a recess, therefore the sheet should be designed to permit cutting in from the edge.

At present, taper-milled sheets are cut to outline after milling. After this, fabrication proceeds as in other metal parts. Warpage from machining of 75S-T6 alloy has not been a serious problem. Since the machining is done on the interior side of an airfoil or fuselage skin, the warpage is generally in this direction and aids rather than hampers subsequent forming.

Advantages of taper-milled sheets

1. Weight is reduced through milling off much excess mass in areas where not required.
2. Splices between members of different thickness are eliminated, saving assembly time and weight on splice plates and fasteners. The savings in cost of fasteners alone is an important economy item.
3. Edges of sheets may be left thick, thereby increasing the bearing strength for attachment and reducing the number of fasteners.
4. Islands or reinforcements around access holes or other highly stressed areas are homogeneous with the tapered sheet, eliminating doublers and fasteners; often the thickness of the tapered sheet is less than combined thickness of a skin and splice arrangement.
5. Greater aerodynamic smoothness can be attained through elimination of joints between external skins.
6. That airfoil skins can be tapered both chordwise and spanwise is an important factor in swept back wing aircraft.

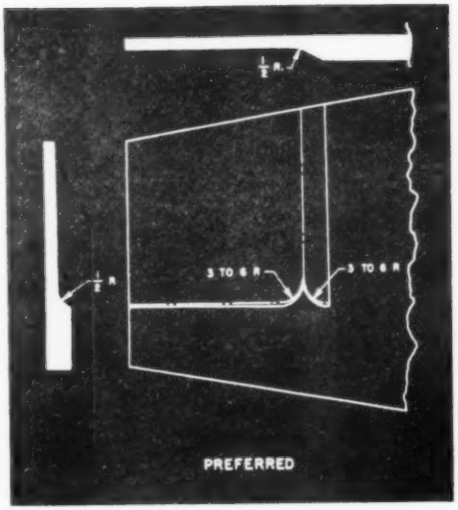


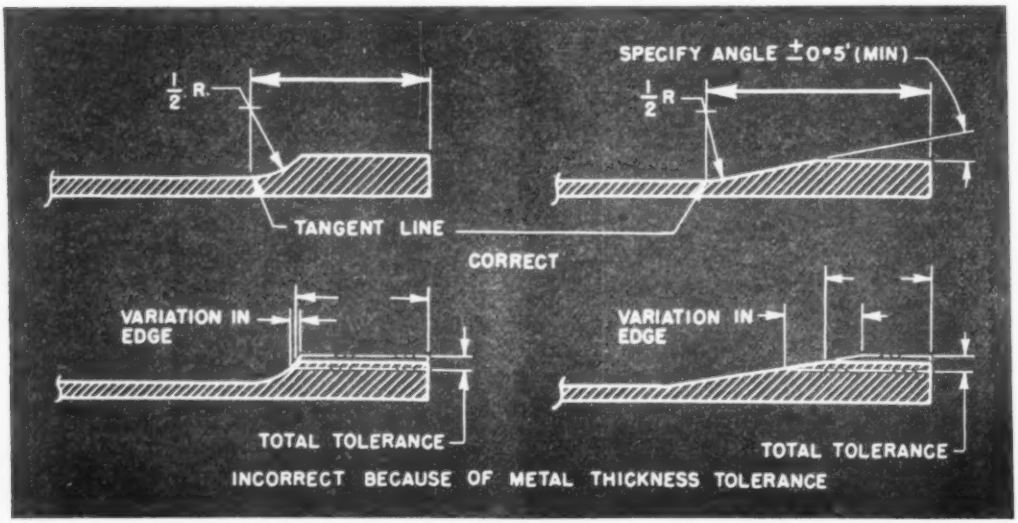
Fig. 4—Preferred type of inside corner blend.

Disadvantages of taper-milled sheets

1. In machining clad aluminum alloy sheets the pure aluminum protective coating is removed from one side, therefore requiring anodizing.
2. In practice the selection of grip lengths of blind fasteners is complicated by the taper and must be carefully controlled by area.
3. At present, material waste is high because of the

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Fig. 5—Methods of dimensioning step lines.

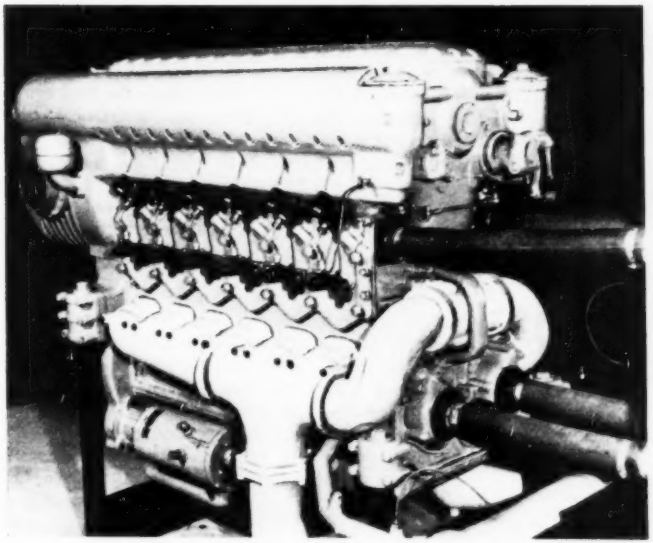


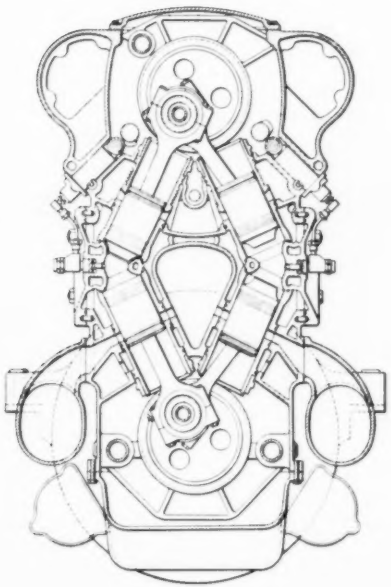
Diamond Type, Two-Stroke

High Speed Diesel Engine

By Donald W. Morris

Chief Engineer,
Morris Development Co.





(Above) Transverse section of Morris diamond type Diesel engine.

(Left) Three-quarter side view of engine on test stand.

A NEW high-speed, heavy-duty, diamond type Diesel engine designed and tested by the Morris Development Co., Los Angeles, Cal., is a 24-cyl, two crankshaft, opposed-piston, two-stroke cycle engine, with 3¼ in. bore and 3⅞ in. stroke. It is intended to be rated at 400 hp at 2650 rpm. Indicated potential (although not a final power limitation) is 550 hp at 2800 rpm.

This power unit is 24 in. wide, 47½ in. high and 63 11/16 in. long. Weight, complete with cast iron block and all accessories is 3300 lb. Through use of an aluminum block and other indicated weight-saving measures the designers state that the weight of the engine can be brought under 2500 lb. With an indicated potential of 550 hp, weight ratio can be cut to 4½ lb per hp.

The Morris Diesel has 12 injectors as there is a common combustion chamber for each set of two pistons. Piston control of intake and exhaust ports eliminates valves. Two lightweight, high-speed Roots type blowers mounted above the flywheel, coupled by flexible torque shafts to the gear train, supply air to the engine in proportion of 1.4 times the displacement. To facilitate ease of mounting and to save space and weight, two water pumps rather than one, are mounted on the front of the engine.

A major innovation is the gearing between the crankshafts. A helical gear on the upper crankshaft engages a gear on the front end of a flexible torque shaft which runs to the rear of the engine. Here a small gear is connected to a gear on the lower crankshaft through an idler gear. Due to the 12 deg timing lag of the upper shaft, with resultant greater power output through the lower crankshaft, this gear system has only the relatively light construction required to carry the smaller percentage of the total power output.

This engine design requires a minimum of mechanism per

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High Compression Without

By Alex Taub

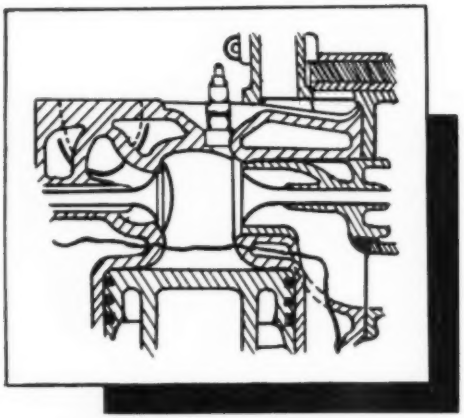


Fig. 8—Ricardo tank engine combustion chamber of 1918.

In order to develop the picture on the opportunities that are inherent in non-detonating engines it is necessary that we retrace our steps and examine the work of the men who have established the fundamentals behind the progress that has been made in vehicle spark ignition engines since the Nineteen-Twenties. By following through with this basic work we can establish our future.

Two men stand out, Sir Harry Ricardo and Robert Janeway. These two men have laid the foundation of our combustion chamber progress. Ricardo is responsible for our becoming combustion chamber conscious. This does not mean he has always been right. He has freely admitted that his combustion chamber beliefs have constantly changed with his own progress, and that is as it should be, and when one has met and talked with this great engineer it is just what you would expect of him.

Ricardo was the pioneer. He visited this country in 1922 and read a very comprehensive paper on research work on the internal combustion engine. Detonation was the lone inspiration for his combustion chamber investigation at that time. Ricardo explained the phenomenon of detonation as the creation of an explosive wave, or an almost instantaneous pressure rise caused by the super compression of the unburnt portion of the mixture by the very rapid pressure rise of the burning portion, to a point where the temperature rise of the unburned is faster than the heat can be transferred. At this point the unburned portion ignites at one time, increasing the pressure rise of the whole burning charge, with a possible springing of the walls of the combustion chamber. Under the process, Ricardo states, "Therefore, it would appear fairly certain that detonation depends primarily upon the rate of burning of that portion of the charge first ignited and it remains to determine just what controls this rate."

Ricardo's explanation as to the superheating of the unburned portion by compression and radiation of the burned portion is one of the most important factors in combustion chamber detonation theories down to date. Here, Ricardo pointed the way.

Ricardo made his first disavowal of turbulence in this same paper in a further explanation of how to control the pressure rise of the first gas to burn. He states, "From more recent investigation my belief in this has been considerably shaken. I now feel bound to confess that I can find no real evidence that turbulence, while invaluable for other reasons, influences detonation in one way or another."

The probable reason for dropping turbulence as a major factor in detonation control is that it was essential to Ricardo in the light of his new theory, which made necessary the control of burning, or pressure

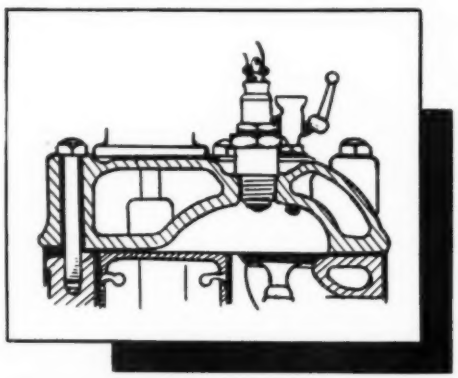


Fig. 9—Ricardo high-turbulent L-head.

High Octane Fuel

What Are its Possibilities?

PART THREE

The History of Combustion Chamber Design Is Traced in This Installment of a Four-Part Article, with Typical Designs Described and Illustrated. Mr. Taub Draws the Conclusion That Internal Hot Spots, the High Temperature of the Exhaust Valve in Particular, Must Be Eliminated or Made Innocuous.

rise, of the first gas to burn. More turbulence meant increased rate of pressure rise and he was seeking a means of minimizing the effect of pressure rise. Ricardo's explanation of the reason for the non-detonation of his high turbulent head was, "This was due not to the turbulence but rather to the fact that in each instance the maximum distance that the flame could travel from the spark plug was exceptionally small."

It must be remembered that Ricardo was a disciple of Tizzard and was influenced by his conclusions. Tizzard's conclusions were:

1. "Detonation depends primarily upon the ratio of burning of that portion of the charge first ignited."

Today we know that the rate of burn of the first portion to burn has no effect on detonation at all.

2. "The rate of burning increases very rapidly with a slight increase in flame temperature and whether it will prove sufficiently rapid to produce detonation depends upon the ratio between the rate of evolution of heat by the burning portion of the mixture and the rate of heat loss."

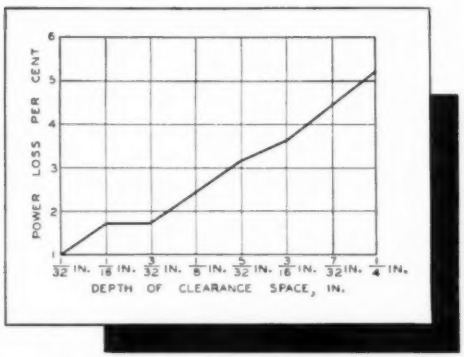


Fig. 10—Power loss for no detonation from varying depth of close clearance.

Here is a beginning of the truth that the rate of heat absorption must be more than equal to the rate of heat picked up or generated in the unburnt mixture. However, the speeding up of the flame movement by an increase in temperature can only affect detonation

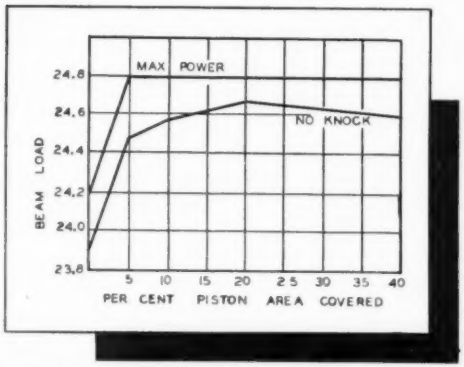


Fig. 11—Power loss at borderline detonation for various clearance space areas.

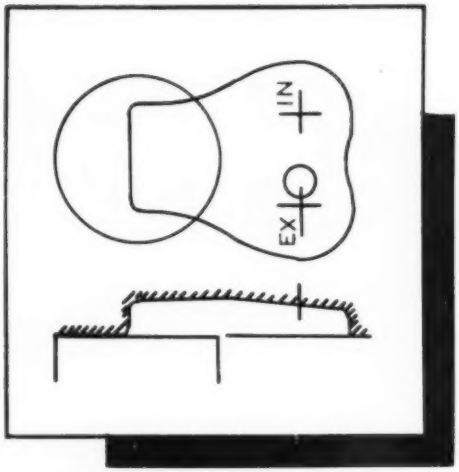


Fig. 12—Janeway's anti-shock head.

because heat is added, not because speed is added. Heat will add speed, and speed may effect the rate of pressure rise but not detonation.

3. "The chance that rate of burning of any portion of the mixture will become so high as to cause detonation depends but little, so far as the practical engine conditions are concerned, upon the temperature or pressure of compression but rather upon the maximum flame temperature."

This begs the question because the higher the mixture temperature the higher the maximum flame temperature through a high geometrical progression. One degree F mixture temperature may mean 50 to 75 F on maximum flame temperature, and if the pressure can be increased without raising the initial temperature of the mixture then it will have little effect on final temperature and detonation. This condition prevails with a supercharger and an intercooler.

4. "For any given mixture strength the maximum flame temperature depends primarily upon the proportion of diluent or exhaust products present. It depends also on compression temperature, but this varies comparatively little over a wide range of compression ratios while the variation in the proportion of residual exhaust products over the same range exerts a greater influence in diluting and thus lowering the temperature of the flame. Thus, a difference of 1 per cent by weight of exhaust diluent will raise or lower the flame temperature by 25 C. or 45 F., which is a range of compression ratio of 4 to 1 to 5 to 1."

The exhaust dilution has been used to control detonation in air-cooled engines where an extreme of valve overlap is used to bring it about.

It should be borne in mind that today all heads are turbulent. In the period of Ricardo's beginnings, compression ratios were between 4 to 1 and 5 to 1.

Table I Quantitative Comparison of Smooth and Rough Engine

	Smooth	Rough	Relative
Maximum rate of pressure rise psi/sec	162,300	344,000	2.18
Restoring force psi-sec	188,370	465,000	2.47
Maximum acceleration in pressure rise psi/sec/sec	93,000,000	567,000,000	6.1
Restoring force, psi/sec/sec	149,000,000	605,000,000	4.05
Relative kinetic energy of deflecting mass $(2.47)^2$			6.10
Maximum restoring force psi	439	543.7	
Maximum pressure psi	410	410	
Shock factor, per cent	7.07	32.6	4.6

Note—The shock factor is obtained by the formula:

$$\frac{\text{maximum restoring force} - \text{maximum pressure}}{\text{maximum pressure}}$$

Any head over 6:1 is turbulent by virtue of its relative size of swept volume to combustion chamber.

Fig. 8 represents the original Ricardo tank engine combustion chamber of 1918. This engine was unusually free from detonation and operated comfortably on kerosene at compression ratios of 4.25 to 1. This is the chamber that led Ricardo into his special research on cylinder heads.

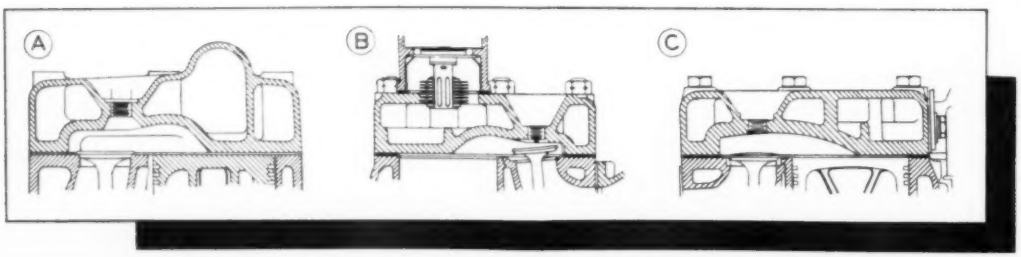


Fig. 13—Three modern L-head combustion chambers; Autocar, Willys and two-ton Dodge truck.

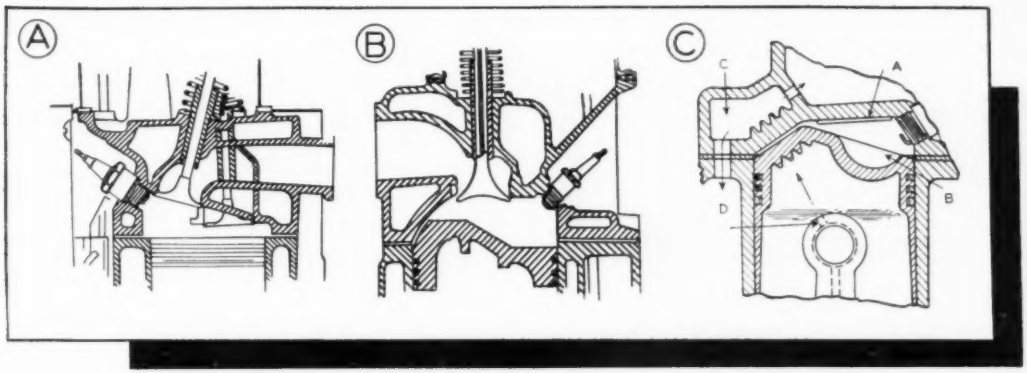


Fig. 14—Combustion chambers of three overhead engines with high volume at the spark plug, tapered to a quench area. A—Chevrolet. B—Buick and GMC truck. C—Vauxhall 12 hp.

From this head Ricardo developed his famous high turbulent L-head, Fig. 9, and he stated that this head proved to be the best head he had tried. Considering the following that this combustion chamber had, and has today, it must be reckoned generally as the most important head design in the history of the industry.

Ricardo in 1927, being conscious of growing complaints against combustion roughness or combustion shock, began a series of publications covering his research work. Referring to roughness he said: "Roughness or shock as ordinarily meant is a harsh feeling and a tendency to cause drumming and is dependent on the one hand on beam stiffness of the engine as a whole and of the crankshaft in particular, and on the other hand on the rate of pressure rise."

These facts were recognized by Janeway in laboratory work in 1925. However, since Ricardo was restricted by British patent law from publication, it must be assumed that he had arrived at this conclusion earlier. In 1930 few American manufacturers were aware that power plant rigidity was essential to combustion satisfaction and today, 1949, it is appreciated but may not be understood too well.

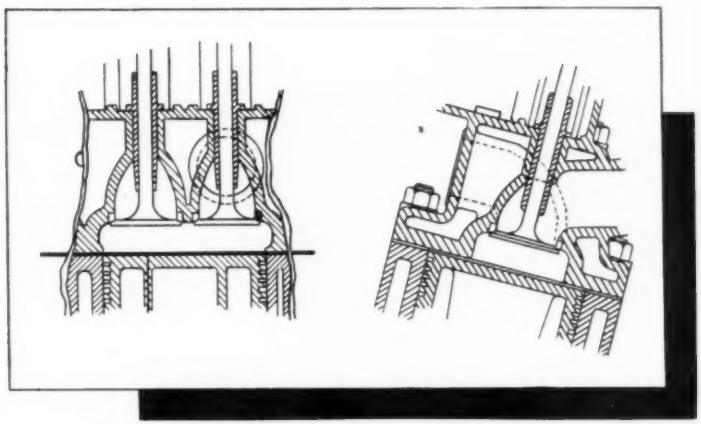


Fig. 15—Sections through Fageol Twin Coach engine.

In 1927 Ricardo published his indicator cards and from this work developed his roughness comparator of maximum rate of pressure rise per degree of crank angle. This comparator has been used by many experimenters since that time.

The weakness in this valuation as we know it today is the fact that the rate of pressure rise alone can have little comparative value since it must combine with pressure before it can deflect the crankshaft or the crankcase. A high rate of pressure rise with five to 10 per cent only of the mixture in the chamber burnt will have less kinetic energy than the same high rate with 50 to 60 per cent of mixture in the chamber burnt.

In 1929 Ricardo first published his awareness of the effect of the quench area for anti-detonation. He stated it was important to, "Reduce the length of flame travel from the spark plug to the furtherest point in the combustion chamber by rendering inoperative so far as detonation is concerned the part of the combustion chamber on the farthest side of the piston. This was done by the piston coming into such close contact with the head that the gas between these two relatively cool surfaces was so

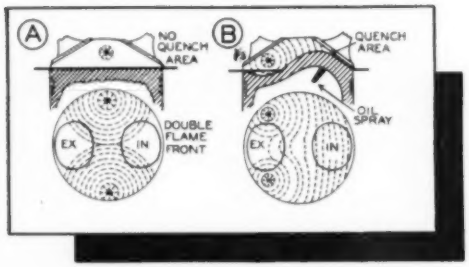


Fig. 16—A—Relative flame front in hemispherical combustion chamber of aircraft engine with two spark plugs located between the valves at opposite sides of combustion chamber. B—Relative flame front in hemispherical combustion chamber with spark plugs near the exhaust valve.

chilled as to avoid detonation."

Ricardo had expanded his original objectives of his high turbulent head and finally put his finger on its most important feature.

Janeway began his investigation of combustion chambers at General Motors in the early part of 1923. He was in constant association with Thomas Midgly during his development of anti-knock additives for fuels.

Janeway differs from Ricardo in that he is not a designer or a mechanic, neither is he the chemist that most of the investigators that followed are. He is an authority on thermo-dynamics. A heat unit to Janeway is as definite as a piece of steel. Janeway was a rapid, tireless worker and a deep prober, impatient with us who lagged behind him. It is because of his ability to delve deeply that he becomes disrespectful of what he might consider superficiality.

In 1924, Janeway was engaged in determining the merits or demerits of the Ricardo high turbulent head, and from this work some of the most important fundamentals of combustion chamber design were set.

He found that in L-head engines: 1. "Regardless of form the best firing position for power is at the center of mass." 2. "Combustion chamber form has very little influence on thermal efficiency for given compression ratio." 3. "The offset type of head for L-head engines offers the best opportunity for increasing efficiency through higher allowable compression ratio."

With reference to Item 1, this is in direct agreement with Ricardo and like Ricardo Janeway modified his opinion in the interests of smoothness. In Item 2, Janeway is arguing against Ricardo's claim for greater efficiency for high turbulence.

Janeway constantly refers to Ricardo's high turbulent head as an offset head. He, at that time, gave as his reason that he "was of the opinion that this head was no more turbulent than any other type, since the major creation of turbulence is during induction and that there is very little additional effective turbulence during the compression stroke." If this was so then there would be very little total turbulence. The mix ture during compression moves far and fast and the residue of this motion must make up most of the turbulence present at the time of ignition.

With reference to Item 3, Janeway states that the offset head offers the best opportunity for increasing efficiency. This is because of the clearance space, which allows a higher useful compression ratio. Janeway, like Ricardo, made an investigation to evaluate the thickness of the clearance space.

Fig. 10 shows the power loss in per cent from maximum power with detonation to borderline detonation and this shows that within the range of practical usage from 1/16 to 3/32 in. there is very little difference but the loss climbs rapidly from that point on. Fig. 4 shows the effect on power loss at border line detonation for various clearance space areas.

Here we see that as the area increased up to 20 per cent of piston covered, greater anti-detonation resulted, but the value of the clearance space lowered as it was increased up to 40 per cent. The piston head design used at that time must have been poor since we know today that we can improve antidetonation as we increase the area covered by the clearance area.

In 1928, Janeway summarized his combustion chamber belief as follows:

1. That the effect of the combustion chamber on detonation is entirely due to heat transfer affecting the temperature of the last gas to burn and is determined

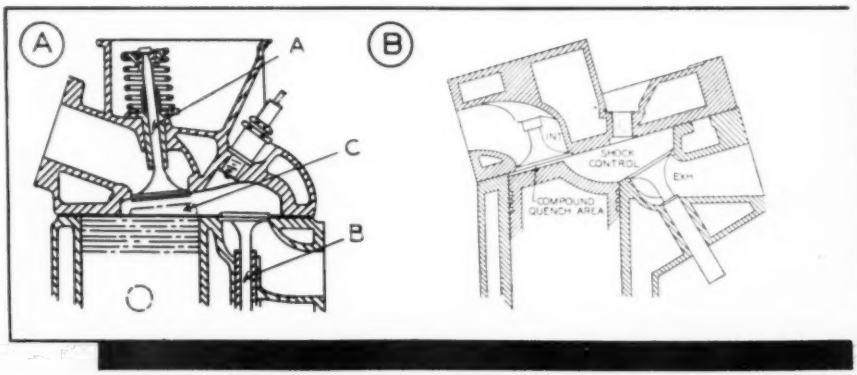


Fig. 17—Three European F-head designs. A—Rolls-Royce Bentley. B—Rover. C—New design now under development.

from the following factors:

(a) Location of that portion of the gas that burns last.

(b) Shape of the chamber.

(c) Location of the spark plug.

2. That while turbulence is an important factor in engine operation according to experiments the combustion chamber form does not appreciably influence the effective turbulence within limits.

All investigators agree that the last gas to burn must be in the coolest place, except Whatmough, who for reasons he alone knows, says, "This may be too cool and may require heating."

The shape of the chamber referred to in (b) is claimed as important to detonation control. However, since each expert has a shape of his own we must conclude that shape as such is not important, that a wide variation in shape is permissible for the same degree of heat transfer.

Janeway's anti-shock head is shown in Fig. 12. This head like all anti-shock heads is non-compact. Janeway's major contribution to combustion chamber art is in his method of analysis with reference to shock control. Janeway maintains that the rate of change of acceleration of the pressure rise is the controlling element in engine roughness or shock. This agrees in spirit with Ricardo's claim for pressure increases per degree of crank angle, and a tremendous amount of experimental work by others over a period of twenty years confirms this fact.

Janeway recommends control of roughness by regulating the volume in the head progressively burned. This is accomplished by control of the flame front area which is equal at all times to the area of unburned gas that is exposed to inflammation. He has gone further than any investigator since he offers a means of evaluating shock or roughness. In principle, Janeway's method of shock analysis is to predetermine a time pressure card based upon the per cent volume burnt for per cent distance the flame travels, assuming the flame travels forward in spherical form and that the entire movement takes place with the piston standing still. In order to bring into focus the tremendous forces that play a part in roughness, Janeway gave the data shown in Table I.

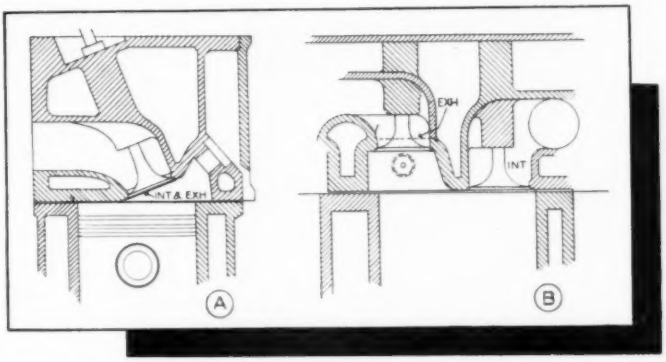


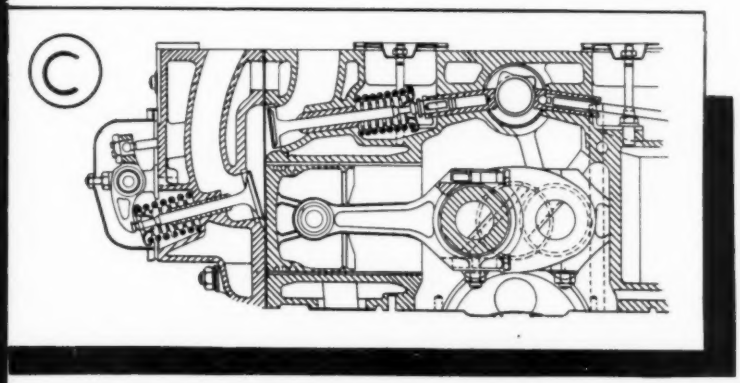
Fig. 18—A—Schematic design of combustion chamber of two American engine and a new European truck engine. B—New Polish truck engine combustion chamber.

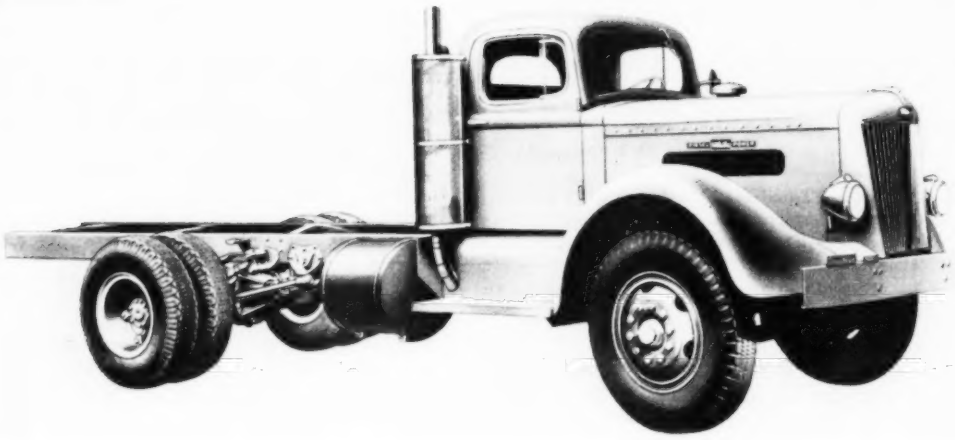
Briefly, Janeway states that shock is a matter of deflection of the structure and that must depend on the forces actuating it. When actual time and loads are considered these forces assume tremendous values and impart to the structure stored forces that must be restored to regain equilibrium. The effect of these values are much higher than the possible effects of the static loads resulting from the maximum pressure. Experience supports Janeway's determination that acceleration of the rate of pressure rise is the factor that has pointed the way to a useful yardstick for roughness control. This principle squares with Ricardo and other investigators, but not with all.

Janeway, being an extraordinary mathematician, has attempted to provide a mathematical approach to the predetermination of shock or roughness and this must be recognized as a most important contribution to the science of combustion chamber design. It was so in 1929, and is still so in 1949. To date no investigator has even offered a method of predetermination of roughness unless he based it on Janeway's work.

Common factors for combus-

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White Brings Out Complete Series of Diesel Powered Units

Powered by the Cummins NHB-600 of 743 cu in. displacement and developing 200 hp.

A LINE of trucks, tractors, and six-wheel units equipped with Diesel engines has just been announced by the White Motor Co. These models are powered by the Cummins NHB-600 Diesel engine of 743 cu in. displacement, developing 200 hp at 2100 rpm and a torque of 535 lb ft at 1200 rpm.

White-Diesel truck models are the WC-28D with wheelbase ranges from 134 to 224 in., the WC-32D in wheelbases from 146 to 224 in., the WC-2864D six-wheel unit in wheelbases from 176 to 212 in., and the WC-3246D six-wheel unit in wheelbases from 176 to 245 in. White-Diesel tractor models are the WC-28TD in wheelbases from 134 to 158 in. and the WC-2864TD six-wheel unit in wheelbases from 158 to 176 in.

Standard specifications include a front axle of the 12D reverse-Elliot type and rear axle of the single reduction, full-floating type with gear ratio of 5.57. Propeller shafts are of the Spicer, needle bearing, 1800 series. Service brakes are of the four-wheel, internal expanding, air-operating type for the four-wheel units, and six-wheel type for the six-wheel trucks and tractors. A four-shoe disk hand brake, mounted on the frame at the rear of the transmission, is used. The frame of the chassis is of the single channel type, made of chrome nickel steel, SAE 3125, heat treated.

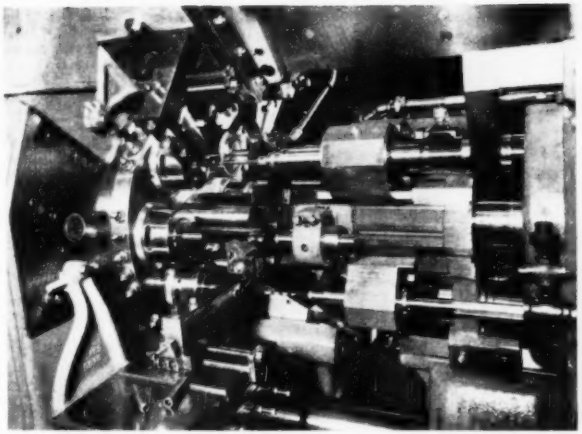
The steering gear on White-Diesel models is of the twin lever and cam type. Front and rear springs are semi-elliptic, and rear springs are equipped with auxiliary springs. The instrument panel of the cab is of the built-in type with detachable sub-panel for servicing instruments.

The cooling system has a capacity of 38 qts and incorporates a centrifugal water pump with full by-pass thermostat. Fuel tank capacity is 44 gallons. Output of the generator is 50 amp at 12 volts; it is equipped with a current and voltage regulator. The 24-volt starting motor is a straight-drive type.

A Spicer two-plate, 14-in. clutch with clutch brake is used, and the Fuller model transmission with 10 forward and two reverse speeds is employed. This provides a wide range of gear ratios.

In addition to its regular Diesel line, White also puts out a line of "Western Diesel" models, similar to the standard truck and tractor models but having special transmission and auxiliary transmission to provide additional gear reduction. These are designed to meet the special requirements of the eleven western states.

Valve Guide Bushings by Simplified Method



Closeup of six-spindle automatic tooled for machining Cadillac valve guide bushings, this view being taken in front with guards removed.

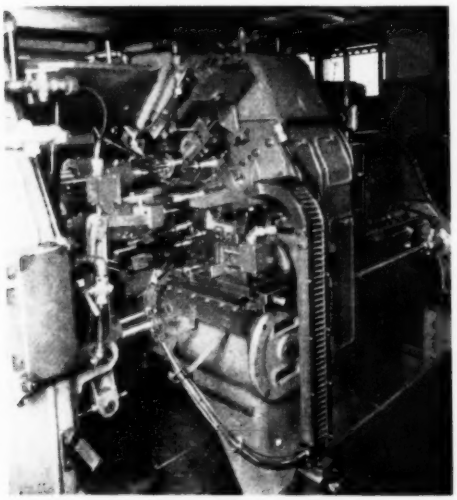
DURING the past few years the Cadillac Motor Car Div., General Motors Corp., has employed a unique method of producing valve guide bushings and as a result has simplified the manufacturing steps by comparison with conventional procedure. Briefly the practice is to start with cast iron rods of proper length, rough centerless ground on the OD, then finish all over in a six-spindle automatic. Following this the parts are finish-ground on the OD in a centerless grinder. Final operation is to precision-bore the inside diameter, holding both diameter and concentricity with the OD to a total tolerance of 0.0015 in.

Recently this procedure has been further simplified and made more economical by the installation of a $1\frac{1}{4}$-in., six-spindle automatic, with tooling designed for double-index, and with parts handled automatically from start to finish, including that of the double-index function. As currently tooled this machine is capable of producing close to 400 pieces an hour. Because the volume of fine cast iron chips poses a serious maintenance problem, the machine has been fitted with a built-in chip conveyor. In addition, cutting is done with a stream of mineral oil primarily to wet and wash away the chips and also serve as a coolant.

Loading for the first operation is done at the sixth position. To this end, the rough pieces are loaded into the chuck by means of an air-operated loading device. The first cutting operation then takes place at the second position. Here the OD is turned part way while a 13/32 in. hole is drilled in the open end. Drilling is done with a solid Tantung drill.

The second stage of the first operation is done at the fourth position. At this point a 5/16 in. hole is drilled part way through with a Tantung drill; and at the same time a form cutting tool comes in to face and chamfer the end. At the completion of this operation the part is ejected into a spiral chute which leads downward, as illustrated, and out to the side of the

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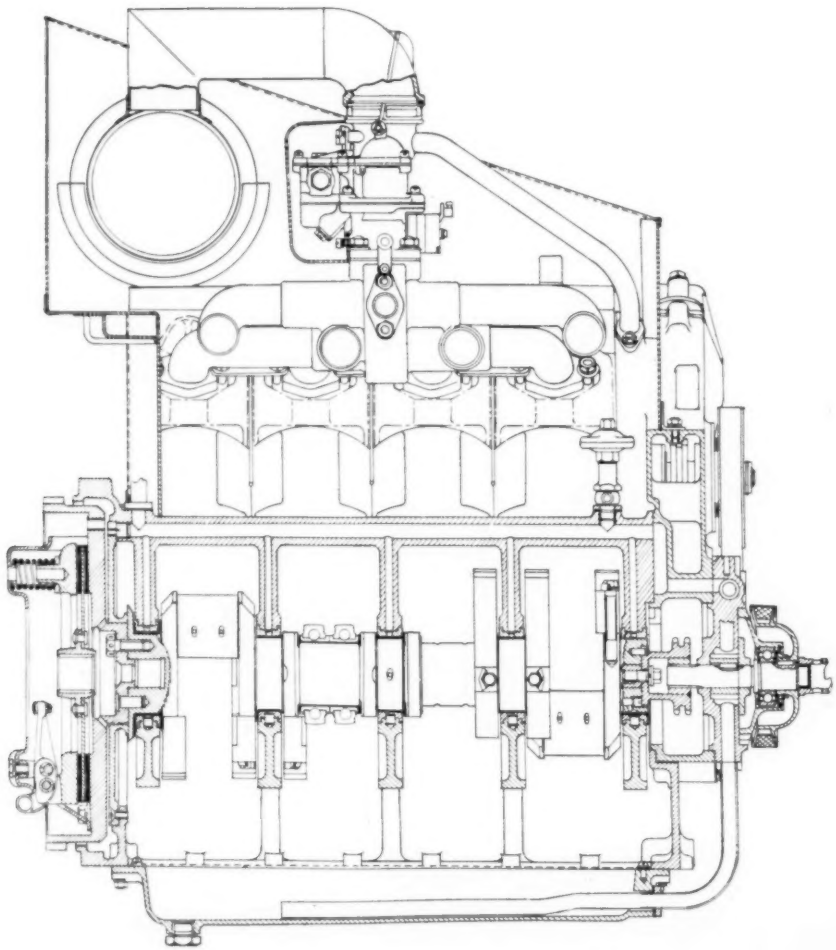


Rear view of the work station of the six-spindle automatic shows clearly the arrangement for loading and unloading for double-index machining. At the completion of the first index at the fourth position, work is automatically ejected into the chute in the center and led by gravity to the lower end of the vertical magazine at the right. Here the parts are fed upward one at a time. As parts move over the hump at the top they are free to drop by gravity to feed the second index cycle.

The

Longitudinal section of the aircooled, V-type Tatra 87 engine. One timing chain drives both overhead camshafts. The chain has two idlers, one of which can be adjusted from outside the case. This 75-hp engine has a bore of 2.95 in., a stroke of 3.31 in., and a displacement of 181 cu in.

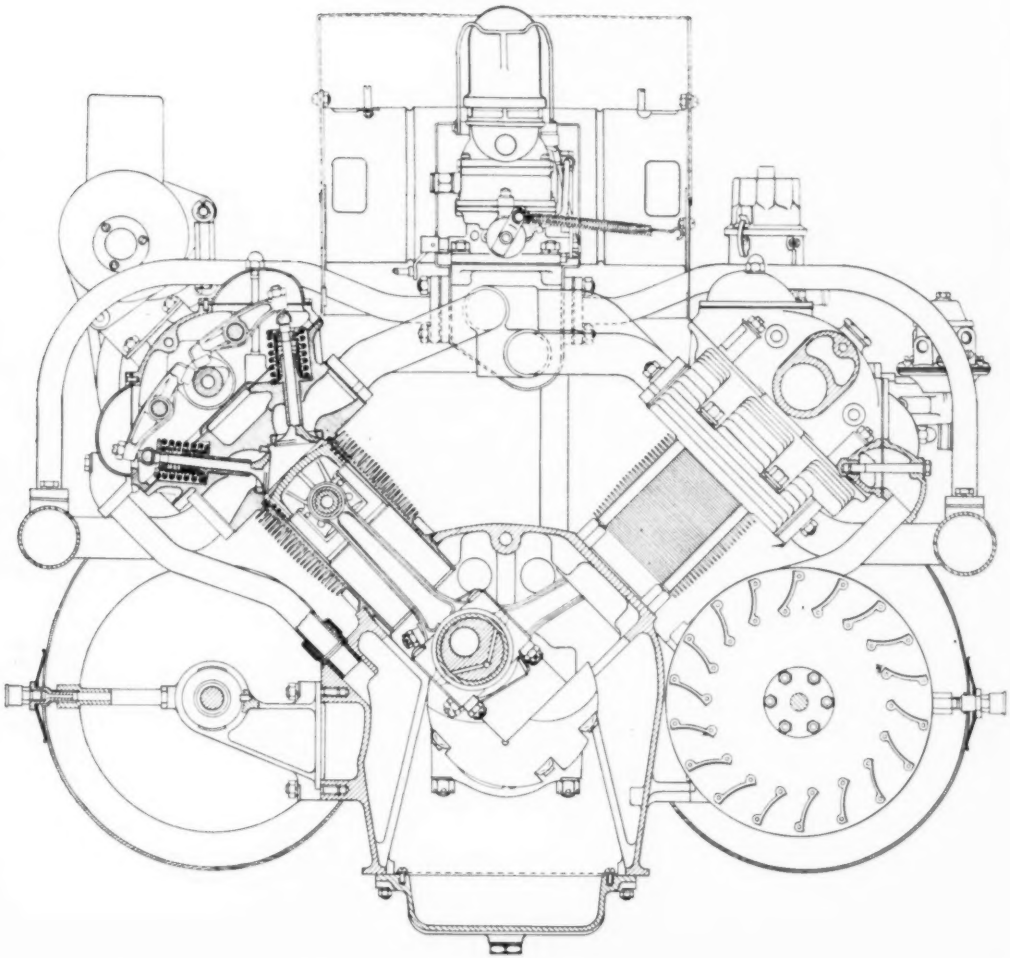
Cross section of the Tatra engine. Side-by-side connecting rods are used with pressure lubrication to their lower bearings. Compression ratio is 5.6 to 1. The carburetor is a Solex 30 AAIP.

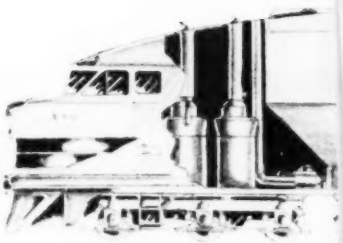


Tatra 87 Engine

Details of the Rear-Mounted Engine Made by

Tatra National Corp., Praha, Czechoslovakia





Artist's conception of a two-car turbine-powered, powdered coal-burning locomotive. Redrawn from Northrop News.

Coal Burning Equipment Developed for Gas Turbine

By R. Raymond Kay

DEVELOPMENT of a full scale system for the use of powdered coal in gas turbine powered locomotives has been completed recently by the Turbodyne Corp. under contract with the Locomotive Development Committee of Bituminous Coal Research, Inc., a group of Eastern coal producers and railroad companies. The project has been under way since mid-1947 when the contract was negotiated.

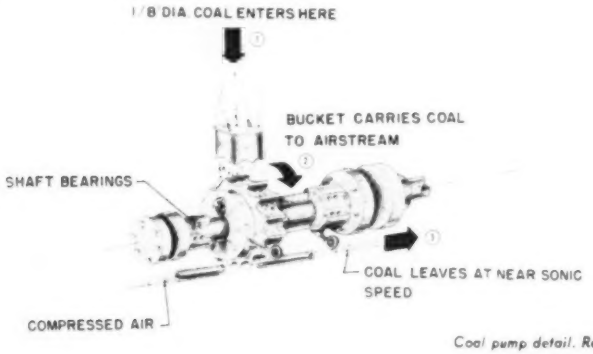
The original contract negotiated between the Turbodyne Corp. and the Locomotive Development Committee called for testing full-scale coal handling and combustion equipment which was to be supplied by Eastern development agencies of the LDC. Soon after the inception of the program it became apparent that no equipment was available for supplying finely pulverized coal under pressure, nor was there any apparatus which could remove a sufficient amount of fly ash to eliminate the danger of abrasion of the turbine blades. The field of pressurized coal combustion was new at that time, and the Turbodyne Corp. was finally requested to assist in the new development work.

A coal handling and combustion system was set up at Fontana, Calif., at the Kaiser Steel plant where 100,000 cfm of air at 35 psig was available for testing components essential to the program. Testing full scale combustor and gas stream delivery elements which had been designed from small scale models built under LDC direction in the east was the first project in the new laboratory. The objective was the development of an efficient coal dust burning chamber and a system of delivery to carry the high temperature, high pressure gases from the combustor to a turbine engine.

The Turbodyne Corp. has since devised improved methods of powdered coal handling and combustion, and has entered into the design and development as well as testing of the various units. The latest process consists of four phases; coal preparation, pressurizing, combustion, and fly ash removal.

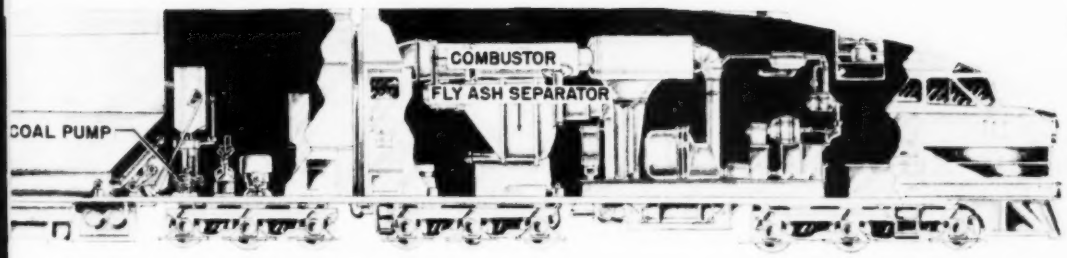
The function of the coal preparation system is to keep an adequate supply of finely crushed coal in the storage tank which supplies the feeder. Coal starts from a bunker and is pushed by a large feed screw to the crusher which reduces the coal to a maximum size of ⅛ in. Crushed coal is then conveyed to the crushed coal storage tank, from which it is fed as required by a coal feeder to the coal pressurizer.

The coal pressurizer is a rotary pump,



COAL PUMP DETAIL

Coal pump detail. Redrawn from Northrop News.



the rotor of which has saw-tooth pockets around its outer edge. It picks up coal from the coal feeder which is at atmospheric pressure and carries it around into the high pressure zone where the crushed coal is blown from the pump by a blast of high pressure air. Clearance between the rotor and casing of the pump is only 0.001 in. to 0.002 in. in order to reduce to a minimum leakage of high pressure air through the pump. A seal prevents leaking of air across the rotor face.

A high pressure air stream blows the crushed coal from the pump to a critical flow, long expansion nozzle where it is accelerated to supersonic velocities and then directed against a target of very hard material such as tungsten or boron carbide. This device, known as the atomizer, is responsible for the comminution of the coal to the consistency of face powder.

Leaving the atomizer, the pulverized coal is blown into the combustor where it burns up to a maximum of 93 per cent efficiency. It is said that coal has been burned at rates up to 2000 lb per hr in a combustor of approximately 20 cu ft capacity. The combustor employed is 7.5 ft in length and is made of ⅛ in. stainless steel. Its construction provides a film of cooling air for blanketing the flame tube interior. An oil standby also has been developed to permit oil combustion in the event of failure of the coal supply.

Combustion refuse or fly ash is removed in a system consisting of two devices in series. The first, called the conical louver ash separator, consists of stainless steel rings fastened together by rivets, and removes 30 to 50 per cent of the ash from hot gases leaving the combustor. In operation, fly ash which cannot negotiate the sharp turns through the conical louvers is trapped in the apex of the cone and is carried out by permitting a small percentage of the gas to be bled into an external receptacle.

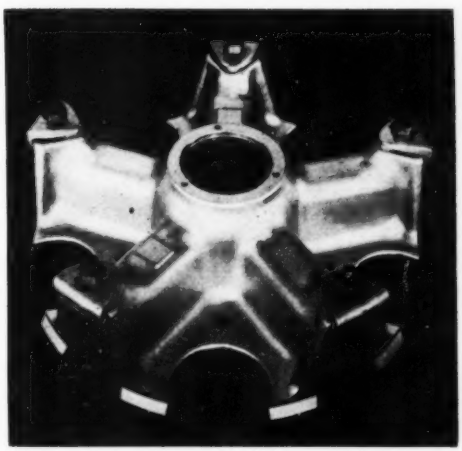
The secondary ash removal device consists of a 19 tube bank of American Blower dust separators which are straight-through centrifugal units in which the dirty gas is rotated at high speed by fixed spin vanes. Ash particles are separated out against the wall by centrifugal force and then bled off the outer periphery of the tube by means of a blow down line similar to that in the louver separator. Leaving the secondary ash removal device, cleansed gas then enters the turbine.

Development of this apparatus has reached the point where its components are believed to be successful enough to warrant testing them on a full-scale gas turbine plant to observe what the effects, if any, will be on an actual turbine, and this plant is now being set up at the Dunkirk, N. Y., laboratory of LDC.

Die-Forged Aluminum Wheels for Trailers

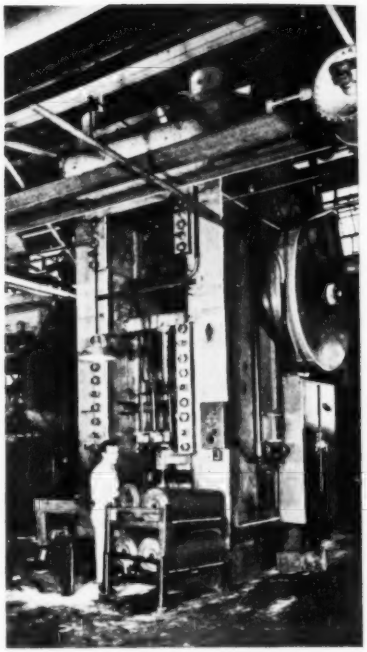
RECENTLY the Fruehauf Trailer Co., announced the adoption of aluminum wheels for stainless steel dry-freight and refrigerator vans in the interest of increasing payload. These aluminum wheels are produced by the Aluminum Co. of America by die forging in heavy duty forging hammers, using the A51S-T6 alloy for the purpose. From the standpoint of the trailer manufacturer and the fleet operator in particular, the chief advantage of the forged aluminum wheel is found in the net saving of almost 50 lb per wheel, by comparison with conventional wheels. For a tandem axle job this represents a saving of 200 lb in wheel equipment alone, and a corresponding increase in payload without exceeding maximum axle loading.

(*Turn to page 60, please*)



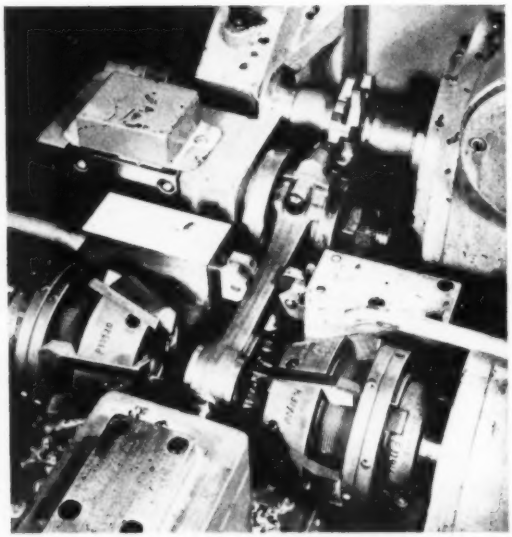
Five-spoke die-forged aluminum wheel developed by Alcoa. The 20-in. wheel weighs 32 lb. weight of the 22-in. wheel is 36 lb.

Huge Press Stamps Out 260 Flywheels Per Hour



THE new 2000-ton Verson "knuckle" press, recently installed at Pontiac Motor Division, stamps out 260 flywheels an hour for Hydra-Matic transmissions. The giant press transforms a flat blank into a flywheel, ready for machining, in one operation. After stamping, the flywheels are sent to the Detroit Transmission Division of General Motors for finished machining, then returned to Pontiac for assembly. So huge is the press that a section of the plant roof had to be removed to allow it to be lowered to its present position. Note the dual controls, making it necessary that both hands be up and out of the way before the machine will operate.

Automatic Balance Milling of Connecting Rods



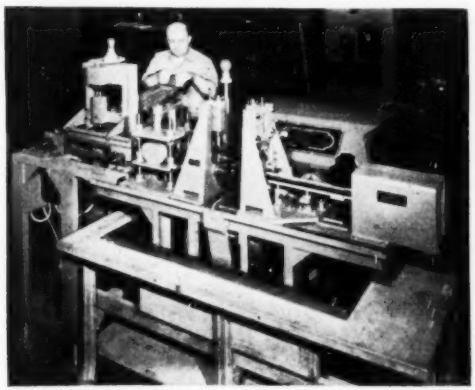
ONE of the interesting machines of recent origin designed for balance-milling of connecting rods, is the Snyder unit illustrated here in a close-up view. It was built for Reo and is currently in operation on the newly installed line for producing the six-cylinder, valve-in-head Gold Comet engine. As shown, weight is removed by hollow-milling on both sides of the small end, and by removing weight from the lower end of the cap. Both ends of the rod are weighed in a balance mounted on one side of the machine, excess weight being noted by the operator. The calibrated reading is then transferred to dials on the machine, which removes weight to this calibrated setting automatically.

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For additional information regarding any of these items, please use coupon on page 52

E-13—Equipment for Selective Hardening

Continuous selective hardening of cylindrical parts at feed rates to six inches per second is possible with an r-f hardening system developed by Westinghouse Electric Corp., Pittsburgh, Pa. Operations can be completely automatic when the cylindrical parts are of design to be hopper-fed into an automatic loading device. When the work has been turned, milled, or drilled for orientation to insure hardening in the proper places, the magazine of the automatic loading device must be manually loaded. After hardening, parts can be moved to the next production step via conveyor belt. The equipment consists of (1) an automatic loading device, (2) a horizontal rotating scanner, and (3) an industrial radio-frequency generator.



Westinghouse equipment for continuous r-f selective hardening of cylindrical parts. Magazine of the automatic loading device is being manually loaded

The automatic loading device consists of a magazine designed to accommodate a particular cylindrical part properly oriented (if orientation is unnecessary a hopper may be substituted); a gate release solenoid-operated, to drop the work pieces in succession on a conveyor belt; and a conveyor belt to deliver work to the in-feed of the scanner.

The horizontal rotating scanner feeds the work through a work coil and spray quench assembly. Uniformity of case depth is obtained by controlled feed; concentricity of the case is insured by positive guide and rotation of the work about its longitudinal axis.

The industrial radio-frequency generator used with this equipment is a standard Westinghouse 10-kw, 450-kc generator. Larger or smaller units can be used, depending upon the diam of the work cylinder and the feed desired.

This equipment can be used to harden a wide variety of cylindrical parts in any desired pattern. Automatic selection of the proper electronic control for any particular part is made by a multiprong plug, attached to the magazine for that part. The plug is wired so that the proper electronic circuit components are set up immediately when the plug is inserted.

This equipment can be adjusted to handle shafts from 2 in. to 16 in. long, of diam ⅜ in. to 2 in., with feed to 6 in. per second, depending on diam of the work shaft and power output of the r-f generator.

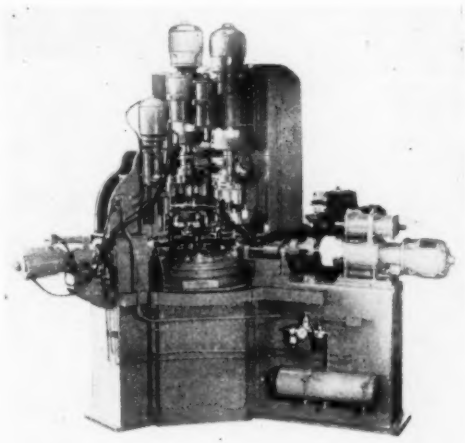
E-14—Air-Hydraulic Drill Unit

Model 5, latest and largest Drill Unit of the Cleveland Republic Tool Co., Cleveland, Ohio, and powered by the same type combined air-hydraulic system previously used in smaller models now installed in automotive and other manufacturing plants for drilling, centering, countersinking, facing and milling operations, features design simplicity embodying only three moving parts in addition to the spindle.

A sealed unit construction in the air-hydraulic system permits drill operation in any position. Design and construction conform to modern tooling practices of grouping single units on simple welded bases rather than building special machines. Any grouping thus can easily be changed to meet changes in design of the work piece. Design has been standardized to include four bases. Only the change of the holding fixture is required when these standard bases are used.

Drill spindle thrust is provided by the plant's air system or an auxiliary supply. The operating principle is based upon a rapid advance to an accurate positive stop, then metered hydraulic feed to another positive stop, and rapid return. The rapid advance travel is consistent to 0.005 in. and the work feed to final depth holds to 0.001 in. In multi-station step drilling this permits the drill to pass rapidly through the previously drilled portion of the hole, to within a few thousandths of the bottom, before assuming the feed rate of travel. The accurate stop also leaves the bottom of the hole accurately located for the next station. These features are also of practical value in spotfacing, countersinking, shaft centering and in some cases may supersede intermittent drilling.

Model No. 5 is available in two to five hp, having a maximum stroke of 6 in. Spindle is normally furnished



Cleveland Republic Tool Co.'s Drill Unit, model No. 5

with a No. 4 Morse internal taper and the quill is designed to be adaptable to multiple spindle drill heads.

E-15—General Purpose Forming Machine

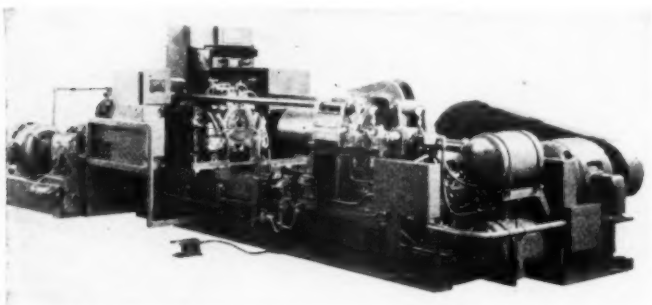
Only ten seconds are required to close completely the end of a 4 in. dia tube with ¼ in. wall thickness when using the latest Westin Process forming machine recently manufactured and shipped by the Federal Machine and Welder Co., Warren, Ohio. Removable dies make this general purpose machine suitable for a variety of applications. Single purpose machines, desirable for continued high production of a single item, are also available.

Once the machine has been initiated by a push button at the operating station, the forming cycle is fully automatic. For short runs of special work, manual operation is provided, controlled by means of a selector switch, with separate push buttons for control of the clutch, chuck, and current initiation. A hand lever, in this case, controls the platen traverse.

The traverse speeds are infinitely variable from 0 to 100 in. per min, and the 8-step spindle speed ranges from 40 to 150 rpm. The three segment die and three transformers permit equal loading of each phase of the conventional three phase system.

Accurate control of forming temperatures provides even heating which prevents work hardening or formation of strain flaws, thus eliminating annealing and post-heating normally required. The quality of the product formed is also accurately controlled, producing scale-free, smooth surfaces, no porosity, and no twisting of the tubing during forming. The metallic structure of the work likewise is kept within controlled limits.

Although generally built in nominal sizes to accommodate work ranging in dia from ¾ in. to 4 in., 4 in. to 8 in., 8 in. to 16 in., machines can be built for working tubing of almost any diameter or wall thickness. Brass, aluminum, copper, carbon steels, and most alloy steels, including stainless, are being worked by the Westin Process, it is reported.



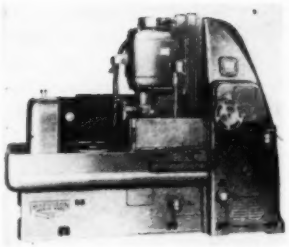
Westin Process forming machine manufactured by the Federal Machine & Welder Co.

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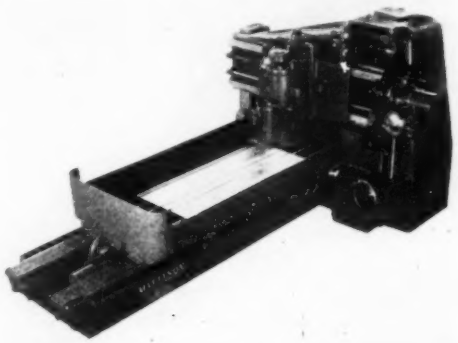
E-16—Production Grinding Machinery

Mattison Machine Works, Rockford, Ill., has purchased the line of production grinding machinery formerly made by the Hanchett Mfg. Co., Big Rapids, Mich., to supplement the line of Mattison high-powered precision surface grinders, the vertical spindle way grinders for dovetails and undercuts, and the line of abrasive-belt grinding and polishing machines which includes the wide belt sheet grinder and polisher, the internal tube grinding and polishing machine, the strip grinder, etc.



Mattison No. 36 rotary type surface grinder with vertical spindle

The Hanchett machines acquired include the surface grinders of the vertical spindle rotary type, vertical spindle rotary automatic, vertical spindle reciprocating type, and the plano type horizontal and vertical Planos. Face grinders acquired include the traveling table (hydraulic), and the traveling wheel. Disk grinders acquired include the single spindle, double spindle, vertical spindle, and automatic single wheel. With addition of this line Mattison claims to be in position to offer machines for handling practically all surface grinding problems.



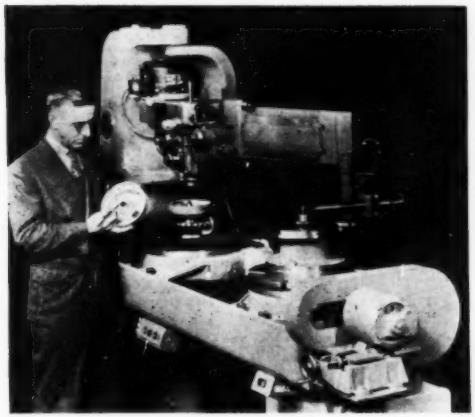
Mattison Plano type grinder with vertical spindle

E-17—Contour Milling Machine

The George Gorton Machine Co. of Racine, Wis., is bringing out their Contour Mill No. CM-12, with rotary master, variable ratios and automatic cycling, for profiling or grooving either the inside or outside periphery as well as the top of cams or cam-like shapes to close tolerances having high surface finishes. Basically, the unit is a tracer-controlled swivel head milling machine which employs rotary tables and operates at reduction ratios of from 2:1 to 10:1. It is said to operate without complicated electronic, hydraulic or pneumatic controls. The contour mill profiles all conventional cam shapes which do not include negative angles, and ac-

commodates most interrupted cam shapes which lend themselves to continuous cycle profiling.

Two 16-in. roller bearing rotary tables mounted on the bed of the machine are geared together and powered by an infinitely variable speed unit which provides the required rpm. Cutter and tracer spindles are mounted on the tracer extension arm. Reduction ratios are set by moving the micrometer bracket to the right or left on this extension arm according to the calibrations engraved on its face. A lead screw is provided for locating the work piece table under the spindle in its various positions. During each cycle, all operations are completely automatic. After the work piece is mounted, a push button turns on all motors and begins the cycle. When the cycle is complete, the machine comes to a stop without attention.



Gorton contour milling machine No. CM-12

The workpiece shape is generated by the shape of the master and the cutter is fed into the work at a fixed depth by the tracer-feed cam. Automatic spindle feed can be furnished.

Spindle speeds from 300 rpm to 10,000 rpm are available, permitting use of high-speed steel cutters, carbide cutters or burrs and, on occasion, grit grinding wheels.

Workpiece diameters of the machine at various reduction ratios are 2:1 = 8 in., 4:1 = 4 in., 6:1 = 2 2/3 in., 8:1 = 2 in., 10:1 = 1.6 in. Although the master copy table is 16 in. in dia, it accommodates larger diameter master cams with the resulting increase in the maximum diameter of the workpiece. If cam or workpiece is thin, several can be profiled at once by "stacking."

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For additional information regarding any of these items, please use coupon on page 52

E-18—Deburring and Polishing Machine

For mass-finishing of metal and plastic products a new type deburring and polishing machine designated as a multi-barrel tumbler has been placed on the market by Hungerford Corp., Big Flats, N. Y. With this equipment, up to fifteen different items can be handled at the same time, without mixing, and each can be tumbled in the manner best suited to its requirements. The variables include wet and dry tumbling; wide range of speeds; rotary, centrifugal and end-to-end actions, and combinations of these actions. Thus, all degrees of contact and impact can be obtained, and delicate parts heretofore requiring deburring and polishing by hand can now be machine-processed without danger of deformation.



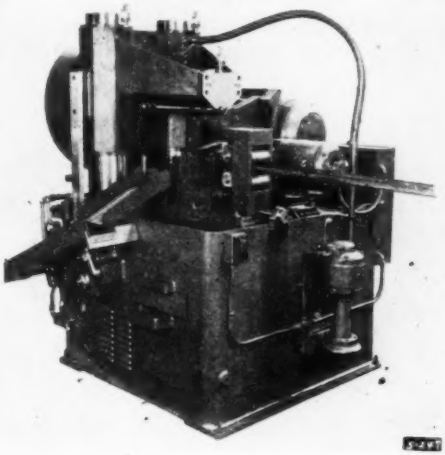
Hungerford multi-barrel tumbler for mass finishing

A circular mounting plate, with multiple perforations at center and six distances from center for attachment of the barrels, is rotated at a fixed speed. The barrels, of numerous lengths and diameters, are of round, hexagonal, clover-leaf, or special cross-section, and can be furnished with or without Neoprene lining. Seventy-three standard units are available. They are mounted at right or other angle to the plate, as an added factor in providing virtually infinite selection in severity of action.

Center mounting produces a mild

E-19—Bar Feed Automatic Machine

Automatic bar feed machine for cut-off or multi-milling operations, designed and built by Kent-Owens Machine Co., Toledo, Ohio. After the bar is placed in the fixture, the head, which carries the cutter, travels in a down direction until the cutter approaches the parts to be milled or cut off. At this point the head automatically goes into feed, feeds until the part is cut off or milled, then reverses and returns in rapid traverse. During the reverse stroke the finished parts are automatically ejected and the bar is moved into place so that the next part can be milled. The operation is continuous until the bar is used up.



Note: Wrong photo accompanied this item which appeared in July 1st issue, page 48. Correct illustration appears at right

rotary action, and selective distances from the center add centrifugal action in desired degree, according to increasing periphery speeds. The angle mounting introduces end-to-end action, as well as rotary and centrifugal actions.

E-20—Gear Finishing Machine

Placed on the market by the Fellows Gear Shaper Co., Springfield, Vt., is a new machine, which represents a distinctive departure in the art of finishing gears. The machine operates on a principle in which the cutter is set at an angle relative to the work. These cutters have teeth of helicoidal shape, and are sharpened by face grinding, in a similar manner to spur gear shaper cutters. This type cutter is able to cut freely without burnishing effect on the work. The cutter finishes both sides of the teeth in one traverse. It becomes possible to remove considerably more stock from the sides of the teeth than with conventional shaving methods, yet cutter life is prolonged by keeping the amount of stock to be removed to a minimum.

The finish on the teeth of the work is governed largely by the traverse feed of the cutter, the feed being varied through change gears. Traverse feed, within reasonable limits, has no effect whatever on the accuracy of the gear produced. Air-operated work-holding fixtures can be applied for clamping and unclamping the work, and a tailstock supports stem pinions.

Operating cycle is as follows: When the gear is completed the machine stops automatically and the work backs away from the cutter an amount equal to the depth of cut. The operator elevates the safety guard, which breaks contact with the button controlling the air-operated clamping mechanism. He then removes the finished gear, and inserts an unfinished gear, the cutter acting as a setting gage. The "start" button is then

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For additional information regarding any of these items, please use coupon on page 52

depressed, which operates the clamping mechanism, preparing the machine to start as soon as the safety guard is lowered. Cutter and work start rotating with a light clamping pressure on the work. After a short interval, full clamping pressure is applied, and at the same time, the work withdraws from the cutter, and cutter is rapidly traversed across the work to the "starting point." The work is then automatically advanced to depth of cut and the cutter is traversed across the work at the desired feed.

E-21—Wheel Forming Attachment

A wheel forming attachment called Diaform, developed by Pratt & Whitney, Division of Niles-Bement-Pond Co., West Hartford, Conn., gives quick, low-cost precision dressing of grinding wheels for accurate form grinding in solid hardened steel. Used on horizontal spindle surface grinders it is claimed to achieve an accuracy to tenths of a thousandth of an inch in hours instead of days. This portable wheel forming instrument form dresses wheels to tenths by means of a dressing diamond, operating on the pantograph principle in tracing from a 10 to 1 ratio template.

The attachment form dresses to a depth of ½ in. on wheels up to 10 in. in width. Width of form, however, is not limited to this dimension. For tool forms greater than 1 in. in width, increments of its profile are successively dressed onto the wheel and the workpiece advanced each time a corresponding amount until the form is complete.

The diamond is chisel-shaped, mounted to rock about the center of a small

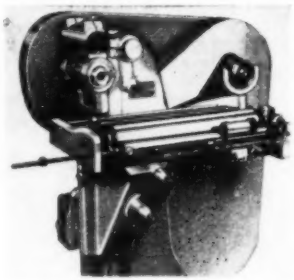


Pratt & Whitney wheel forming attachment, the Diaform

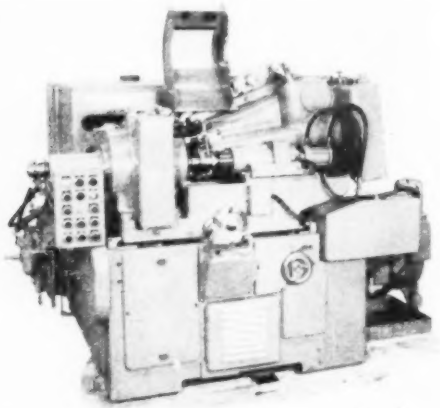
radius on its tip so that it always dresses the wheel at the proper position as it is moved across the face of the wheel under control of the tracer and template. The Diaform is balanced so that only a light tracer pressure is required, with smooth tracing and therefore accurate dressing to "tenths" resulting. Templates are made from 3/32 in. flat metal stock, fabricated by any of the conventional methods.

The tracer itself is carried in the top portion of the vertical tracer and is provided with tangential guard plates having an included angle that is slightly greater than the angle of the dressing diamond itself.

E-22—Air-Hydraulic Milling Machine



Air-hydraulic feed milling machine No. 1 for high speed semi-automatic production, presented by the United States Machine Tool Co. Division of the U. S.-Burke Machine Tool Co., Cincinnati, Ohio. The machine provides 18 full inches of power longitudinal table travel for rapid approach, infinitely adjustable feed, and rapid return. Extremely smooth cut is achieved through operation of the air-cylinder against a hydro check valve.



Fellows No. 12 gear finisher for finishing external spur and helical gears, employing a new type gear finishing cutter

F-26—Abrasive Wheels

Simonds Abrasive Co., Phila., Pa., announces Fibrex Red Wheels, a new type synthetic resin bonded grinding wheel of extra strength and durability manufactured from laminated sheets of cotton fibre filled with abrasive grain. Their field of application is between that of heavy grinding and light sanding as well as for certain types of abrasive cutting-off, deburring and finishing operations.

Wheels are offered in 7 in. and 9 in. depressed center type for use on portable disk sanders and right angle type portable grinders and in straight wheels 6 in., 8 in., 10 in. and 12 in. by ⅛ in. thickness for cutting-off and general purpose use. Slightly flexible, the Fibrex Red Wheel allows a certain amount of side pressure without risk of wheel breakage, and cuts fast and clean without fraying or tearing out at the edge.

These wheels are said to have numerous advantages for weld grinding, particularly on stainless steel and for cleaning up rough, ragged surfaces on structural steel work, fabricated metal parts, etc. They cut a wide variety of



Fibrex Red Wheels for grinding offered by Simonds Abrasive Co.

non-metals including Transite, Celotex, BX Cable, Masonite, plastics, and asbestos as well as most metals.

F-27—Automotive Upholstery

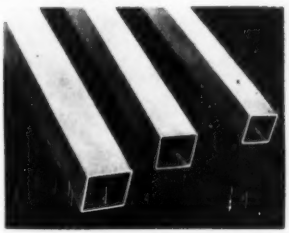
New three-dimensional Candalon automotive upholstery, developed by Collins & Aikman, New York, N. Y., is woven of spun nylon and claimed to have an unusual durability and an aversion to dirt and stains. Most ordinary dirt and stains can be cleaned off Candalon merely by using a damp cloth. Even ink, spilled on the upholstery, can be cleaned with a wet cloth, it is said. The nylon is stated to last longer than the average life of the car, obviating need for slip covers.

Its third-dimensional weave gives the upholstery an extra luxuriousness. Safety-wise, sudden stops caused by modern traffic or other reasons, will not cause car driver or passengers to slide off seats as easily, claims the company.

NEW ★ PRODUCTS

For additional information regarding any of these items please use coupon on page 52

F-28—Special Shaped Tubing



Electricweld tubing in unusual shapes for streamlined modern automotive design, and in square, rectangular, oval shapes is now being produced by Jones & Laughlin Steel Corp., Pittsburgh, Pa. Size range of the new J&L shapes for square tubing is minimum ⅜ in., maximum 3 in., having 14 to 20 gage wall. For rectangular and oval tubing, the minimum is ⅜ in. by ⅝ in., the maximum being any rectangular or oval shape that can be made from a maximum round size of 4 in. O.D., the long size of the rectangular not to exceed 3¾ in., 14 to 20 gage wall.

F-29—Twin Length Welding Hose

A twin oxy-acetylene hose Duo-Weld, in which two lengths one red and the other green are joined by a thin strip of rubber, is a new product of the B. F. Goodrich Co., Akron, Ohio.

Its molded finish cover is smooth, and the tube uniform. Reinforcement consists of one braid of high tensile hawser cord cotton yarn which in the ¼ in. size gives strength comparable to the standard two braid single line construction.

The rubber strip joining the two hose lengths is extremely flexible allowing the hose to be separated into single lengths without tearing into the cover of either length. The hose is being made in 50, 25 and 12½ ft lengths, each length separated approximately 18 in. from each end and secured with a metal ferrule at the separation point.

F-30—Gasoline Ingredient

A new gasoline ingredient claimed to stop rust in automobile fuel systems is announced by Richfield Oil Corp., Los Angeles, Calif. Called RD-119, the new component is blended with Richfield gasoline to give the West Coast its first "rustproof" motor fuel.

F-31—Flexible Couplings



Stock silent chain flexible couplings, Series DSC, offered by Morse Chain Co.

Morse Chain Co., Division of Borg-Warner Corp., Chicago, Ill., has brought out a completely new line of stock silent chain flexible couplings designated Series DSC. The all steel construction of these new couplings combines maximum power transmission capacity with minimum space requirement.

Simplicity of design consisting of two sprockets wrapped with a center guide Morse Silent Chain provides easy installation. Disconnection is accomplished quickly by either of two methods—by unwrapping the chain after removing the single connecting pin, or by moving either sprocket endwise out of mesh with the chain.

Stock bores range from ½ in. to 2⅞ in. with hp capacities up to 119 hp at 2000 rpm. Two covers are available—stamped steel for economy and plastic for maximum protection.

F-32—Improved Carbide Blanks

An improved line of seven sizes of standardized solid carbide blanks for lathe and grinder centers is available from stock at Carboloy Co., Inc., Detroit, Mich.

Length of the new lathe and grinder center blanks has been increased over that of the old style to provide longer center life and to give stronger design. A new size has been added to the list—CT-140—having a length of 1⅜ in. compared to the largest former size of 1 in. long. Center blanks range in dia from 0.250 in. to 0.875 in.

In addition to the increased length, blanks are now ground to a tolerance of plus 0.000 in. and minus 0.002 in. on the dia. Thus they can be fitted easily and accurately into the recess for uniformly strong brazes. Blanks are standard in Carboloy grade 44A only.

(*Turn to page 66, please*)

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

D-28—Chucks

The Cushman Chuck Co.—A new revised engineering catalog, No. 64, has been announced. It covers all sizes and styles of 4-jaw Independent Chucks, 3 and 4-jaw Self Centering, 3 and 4-jaw Combination Chucks and 2-jaw Chucks and Collet Chucks. Photographs and engineering drawings, together with dimensions, weights and price lists are included.

D-29—Finishing Systems

The R. C. Mahon Co.—A new 12 page booklet "Mahon Industrial Equipment" covers complete finishing systems for enamel, lacquer, paint and varnish; spray pickling equipment, filtered air supply systems, drying and baking ovens, and numerous other units of special production equipment.

D-30—Corrugated Expansion Joints

Chicago Metal Hose Corp.—Design Guide to Expansion Joint Selection and Application is the title of a new 28-page bulletin containing engineering data on corrugate type expansion joints. It is written in non-technical language and contains numerous illustrations, charts and tables.

D-31—Rust Preventives

Esso Standard Oil Co.—Selection of rust preventives and utilizing their lubricating qualities, ease of application and removal are discussed in a new booklet, Rust-Ban. In addition to detailed recommendations for the selection of rust preventives, the booklet contains other pertinent information on the use of these coatings.

D-32—Silicone Greases

Dow Corning Corp.—Silicone greases as ball bearing lubricants are described in two publications called Silicone Notes No. D-5 and No. D-6. D-5 gives properties, performance and uses of these head stable and oxidation resistant silicone lubricants. A table of bleed and evaporation values is included, together with other information. D-6 contains information on the use of DC 44 Silicone Grease in bearings of electric motors. It includes instructions for lubricating open and single shielded ball bearings and relubrication schedules based on experience gained in developing and testing silicone grease.

D-33—Gage Tester

Star Brass Mfg. Co., Div. of Williams & Hussey Machine Co., Inc.—A 2-color, 4-page brochure describing and illustrating the Star Deadweight Gage Tester is available. It gives construction details and operating instructions on each of the three models of Star Gage Testers.

D-34—Indicating Gages

Star Brass Mfg. Co. Div. of Williams & Hussey Machine Co., Inc.—The Star line of Superbronze Non-Corrosive Indicating Gages is described and illustrated in a new 4-page booklet. Types, ranges, construction details, as well as the many improvements made in this line of gages, are also described.

D-35—Graphitar

United States Graphite Co.—A 64-page, wire-bound catalog, describing the engineering use of Graphitar, a carbon-graphite product gives complete general information, plus valuable data on properties, chemical resistance and manufacturing limitations. Operating information, including assembly methods and charts, do's and don'ts, and many typical applications complete the catalog.

(*Turn to page* 54, *please*)

TIME SAVER COUPON *for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.*

Readers' Service Department,
Automotive Industries,
Chestnut & 56th Sts., Philadelphia 39, Pa.

Please send me: **These FREE Publications** (Use letter and designating number of each item desired)	*Please send me more information on:* **New Production and Plant Equipment** (Use letter and designating number of each item desired)	*Please send me more information on:* **New Products** (Use letter and designating number of each item desired)
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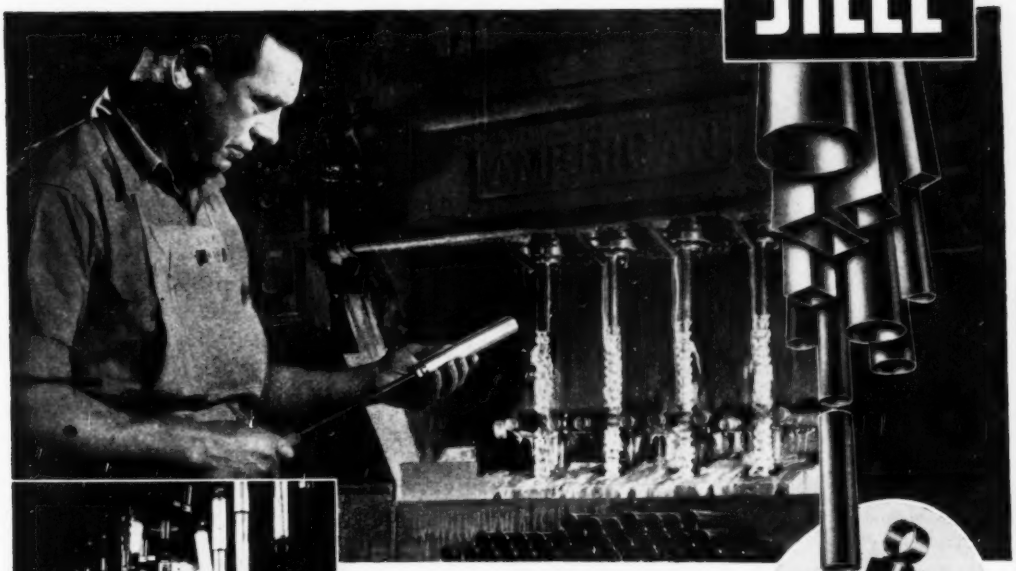
Your Name ..... Your Title .....

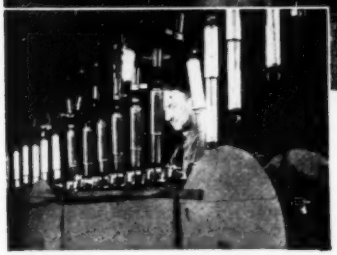
Your Company Connection or Business .....

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Houdaille-Hershey makes better shock absorbers *at lower cost* with J&L free-machining ELECTRICWELD STEEL TUBING

J&L STEEL





(*Above*) Multiple spindle broaching machine at the Houde Engineering Division of Houdaille-Hershey Corporation that machines the inside diameter of J&L ELECTRICWELD Tubing to 1/1000" tolerance.

(*Left*) Aeroplane-type shock absorbers on the production line at the Houde Engineering Division, Houdaille-Hershey Corporation, Buffalo, N. Y.



When production runs into thousands of units daily, every possible saving in material and labor costs in each shock absorber is vital to efficient manufacturing. Houdaille-Hershey Corporation, Buffalo, New York, reduced manufacturing costs when it changed from more expensive cold-drawn tubing to J&L *free-machining* ELECTRICWELD Tubing for the main cylinder of precision-built hydraulic shock absorbers.

This special J&L tubing is made from *resulphurized, open-hearth steel.* The resulphurizing imparts the desired free-machining quality required by Houdaille-Hershey for broaching the interior surface of the cylinders with uniform precision to a tolerance of 1/1000 of an inch.

Because J&L controls every step in the manufacture of ELECTRICWELD Tubing from raw materials to finished product, it can give you the exact grade of steel you need to help you make a better product, faster, and at a lower cost.

If you use tubing in the manufacture of your product investigate J&L ELECTRICWELD Tubing. Write today for your copy of our new booklet: "J&L ELECTRICWELD TUBING *for more strength with less weight.*"

Jones & Laughlin Steel Corporation
430 Jones & Laughlin Building
Pittsburgh 19, Pa.

Please send me your booklet: "J&L ELECTRICWELD TUBING *for more strength with less weight.*"

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY (*hi-tensile steels*).

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

Publications Available

(*Continued from page 52*)

D-36—Bearings

Johnson Bronze Co.—Johnson Engine Bearings is the title of a new catalog which lists connecting rod, main and camshaft bearings and piston pin bushings for domestic cars, trucks and tractors. A numerical listing of camshaft bearings, camshaft bearing sets, and main bearing sets is included. Special motor bearing information is also given.

D-37—Tap Driving Equipment

Scully-Jones & Co.—Standard tap chucks, heavy duty tap holders, spring compression tap holders, tension and compression styles, floating tap driver holders and close center tap drivers are discussed in a special manual. Taper charts, complete prices and specifications, photo-illustrations as well as line drawings are included.

D-38—Compressors

Worthington Pump and Machinery Corp.—A new bulletin describes the company's compressors and dry vacuum pumps. The various types are illustrated and described and accompanied by a size and ratings chart. Cross sectional views of the Monobloc, single-stage and balanced angle single and two-stage vertical air compressors are given. Accessories used with the various types of compressors are described and illustrated.

D-39—Power Conveyors

Lake Shore Engineering Co.—An 8-page illustrated catalog, No. 495, showing Tote-All lightweight, portable power conveyors for handling bulk materials and packaged goods, is available. Included in the catalog are photographs, application and specification data covering Tote-All bulk conveyors, package conveyors, combination bulk and package conveyors and special machines.

CALENDAR

Conventions and Meetings

SAE West Coast Mtg., Portland...Aug. 15-17
Conf. on Road & Motor Transportation, Geneva .....Aug. 23
Canadian Nat'l Aircraft Exhibition, Toronto .....Aug. 26-Sept. 10
Nat'l Air Races, Cleveland .....Sept. 3-4-5
Instrument Soc. of America Convention, St. Louis .....Sept. 12-16
Amer. Chemical Soc., Atlantic City, N. J. .....Sept. 18 to 23
Inst. of Traffic Engineers, Washington, D. C. .....Sept. 25-28
British Passenger Car Show, London, Sept. 28-Oct. 8
Society of Industrial Packaging and Materials Handling Engineers Annual Exposition, Detroit....Oct. 4-7
Paris Auto Show, Paris.....Oct. 6-16
Amer. Soc. for Testing Materials, Pacific Nat'l Mtg., San Francisco Oct. 10-14
Amer. Society for Metals Nat'l Metal Congress & Exhibition, Cleveland Ohio .....Oct. 17-21
Amer. Welding Soc. Annual Mtg. Cleveland .....Oct. 17-21
Amer. Inst. of Mining & Metallurgical Engineers Metals Br. Cleveland Oct. 17-21
Nat'l Safety Council Safety Congress & Exhibit, Chicago .....Oct. 24-28
Nat'l Metal Trades Assoc., Annual Convention, Chicago .....Oct. 26-28
Amer. Society Body Engineers Annual Tech. Convention, Detroit Nov. 2-4
Chicago Auto Show, Chicago.....Nov. 4-12

Bus Seats

(*Continued from page 28*)

seat frame. When placed in the seat, four spring snaps hold it tight.

Standard seat heights are 18 in. to the top of the seat cushion, to 40 in. height for a back, with variations according to bus models, of course. One of the most popular seat frames at Flxible is made of one-in. steel tubes. Tubing is received at the machine shop where it is cut to length and ends are milled to allow close fitting. Following these operations, pieces are shaped in a Parker bender, according to specifications.

Bent tubing is moved to the welding department where the welder places pieces in Flxible-made jigs that positively-locate each of a dozen pieces with locating pins and clamps for welding. Large welds are chipped and smoothed with disc grinders. Stainless steel is sometimes used, and of course remains unpainted. Ordinary steel is degreased after welding, in a Detrex degreaser, before painting. Two coats of paint, primer and color, are ordinarily applied, with green predominantly specified, although Burgundy and brown also are popular.

Woodwork in seat backs follows the pattern as in seat frames, without inclusion of springs in assembly. Rubberized hair (Nucraft) is glued to back boards in thicknesses of 1½ in. normally.

Flxible produces three more or less standard complete bus seats; recliner, non-recliner, and "airporter" models. The "airporter" models are a reclining type. Adjustable foot rests are included in final installation. A mechanism is incorporated in arm rests of most of the seats to control positioning of the back at six different angles.

Parts, numbering some 20 pieces, are purchased outside and the arm mechanism is assembled at Flxible and installed. On the recliner seat, the arm is solid to the seat riser, with the side built of plywood and the arm rest of maple.

Over the maple goes rubber, cemented in place, and cowhide leather is stretched to cover, tacked, and two screws driven through to the steel tubing. Mohair is tacked on plywood sides, at concealed under-points.

Formica covering is used on another type of seat construction, cemented into place and trimmed with aluminum molding. The latter comes to the plant in 12-foot lengths, is cut to size, drilled and counter-sunk, and is held by hand and fastened with power screw drivers. Head-rests go with reclining backs. They consist of molded rubber, one-piece, covered with leather or mohair that is cemented on and tacked around the edges. Sundry pieces of hardware are used in all assembly operations.

We should note that as many as 10 thicknesses of mohair covering material are cut simultaneously on a long work table with power cutters. In fact 10 complete sets of material, for 10 buses, are thus cut to order. About 36 yd of material go into a bus for upholstering seats.

Experiments are being conducted that involve steaming of mohair material to bring its nap up when laid out for cutting operations. Commonly, when piled, such material creeps when the nap lies down.

Special sewing of mohair in multi-colored coverings or trims is done on twin electric sewing machines at one end of the long table where entire bus layouts are cut.

Morris Diesel Engine

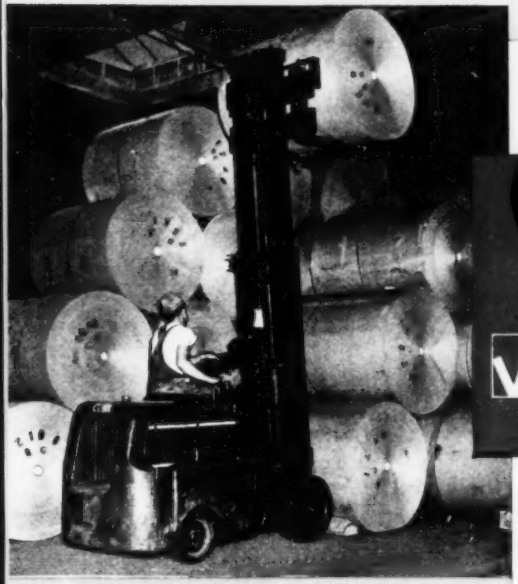
(*Continued from page 33*)

piston. It can be built just as satisfactorily in from one (4-cyl) to 10 (40 cyl) banks, with a range of from 92 to 920 hp. Some of the principal features of the Morris Diesel are: Singly removable, heat-treated, cast iron cylinder liners of 450 Brinell hardness; chrome-plated piston rings; crankshaft construction which utilizes the metal between the crankpins as journals; engine block of cast nickel alloy iron, weight 1350 lb.

Two men, in eight hours, can remove and replace all pistons, rings, bearings, and or cylinder liners, or any combination thereof, with the accessory work involved. The six cover plates on each side, which are also the cylinder heads, are quickly removed by taking off fuel lines and unscrewing head nuts. Then the upper (intake) cylinder liner is slipped out, followed by similar removal of the lower (exhaust) cylinder liner.

Quick access to upper and lower piston and connecting rod assemblies is obtained by removal of the top cover and the crank pan. After the connecting rod bolts are unscrewed, the connecting rods and pistons are simply lifted out past the crankshaft. This is possible by virtue of the unusual crankshaft design.

CLARK ELECTRIC and GAS POWERED FORK TRUCKS



Clark Utilitruc (gas-powered) saves time in tiering heavy rolls of paper fiber board.

more Cost-Cutting applications of VICKERS HYDRAULICS

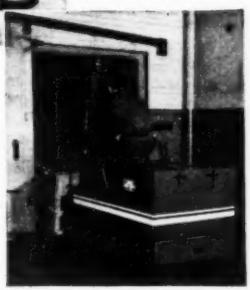
The Industrial Truck Division of the Clark Equipment Company uses Vickers Vane Type Pumps on all of its electric battery-powered models and some gas-powered models to provide hydraulic power for lifting and tilting. Many models also have Vickers Multiple Unit Valves for control of this hydraulic power. Only a few of the many types and sizes of Clark Trucks so equipped are illustrated here. Vickers Hydraulics is an important factor in the cost-cutting ability demonstrated by Clark Fork Lift Trucks on a wide variety of materials handling operations.

Vickers Balanced Vane Pumps are notable for their efficient operation and long life. Their exclusive hydraulic balance construction prolongs pump life by entirely eliminating pressure-induced bearing loads and resulting wear. Write for Bulletins 49-52 and 36-12.

Vickers Sectional Type Multiple-Unit Valves are available in many combinations for operating single- or double-acting cylinders. They provide convenient and selective control and include relief valve for overload protection. Write for Bulletin 40-13.



Clark Elec-Utilitruc reduces the cost of handling locomotive parts in railroad shop yards.



Clark Elec-Carloader with Hi-Lo-Stack device passes easily through a 7 ft high door opening, yet it will tier to 130 inches with ease.



3880

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

PERSONALS

Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.

General Motors Corp.—**Thomas H. Keating** has been appointed general manager of the Chevrolet Division. He has also been elected a vice-president of the Corporation and a member of the Administrative Committee.

General Motors Corp.—The appointment of **George H. Willits** as director of the Patent Section has been announced. He succeeds **Louis M. Spencer,** who is retiring, together with two senior members of the staff, **George A. Lovett** and **Hugh Miller.**

Detrex Corp.—**R. A. Emmett, Jr.,** has been made a special assistant to the general manager to supervise material control, production scheduling, inspection and safety. **J. Doyle Hamacher** has been made superintendent of the equipment manufactring plant. He will also retain his previous title and duties as company plant manager.

Mack Trucks, Inc.—**Alfred H. Ranger** has been appointed plant engineer for the company with headquarters at the Plainfield, N. J., factory of the company. **J. G. VanNest** has been named director of purchases, with headquarters at the Allentown offices.

Chrysler Corp., Dodge Div. — The appointment of **William S. Woolsey** as truck sales supervisor has been announced.

Packard Motor Car Co.—**J. A. Carr** has been promoted to manager of the parts and service department. He succeeds **E. D. Longenecker,** resigned.

Curtiss-Wright Corp. — **Edmund C. Sulzman,** sales manager, Wright Aeronautical Corp., has been assigned the additional responsibility of directing the company's service activities.

Curtiss-Wright Corp. — **Theodore B. Focke,** general manager of the Airplane Div., has been named vice-president and general manager as well as a director of the Wright Aeronautical Corp. **H. Fletcher Brown,** factory manager, has been appointed general manager of the Airplane Div., succeeding Mr. Focke. **Frank H. Hankins** has been appointed service manager and **Robert E. Johnson** has been named manager of sales engineering, serving under Edmund G. Sulzman, sales manager.

Peninsular Grinding Wheel Co.—**R. G. Caulley** has been named vice-president in charge of sales.

Philco Corp.—The election of **James T. Buckley** as chairman of the Corporation's board of directors, succeding the late **John Ballantyne,** has been announced. **James H. Carmine,** vice-president distribution, has been elected executive vice-president.

The Reynolds Metals Co. — The appointment of **C. J. Beneke** as product manager for its wire, rod, bar, structurals and cable division of the company, has been announced.

Purolator Products, Inc.—**James D. Abeles,** formerly equipment sales manager, has been elected assistant to the president, **Ralph Layte.**

Hydraulic Equipment Co.—**Robert F. Hodgson** has been appointed chief engineer.

S-M-S Corp.—**Arthur M. Watson** has been elected vice-president in charge of sales.

Seiberling Rubber Co.—**J. R. Lotze,** formerly merchandising manager, has been named manager of the newly-created Automobile Tire and Sealed-Air Tube Dept.

Necrology

Harland E. Boyd, 62, Regional Business Manager in Cleveland for AUTOMOTIVE INDUSTRIES and *Motor Age*, and a member of the Chilton Company for 34 years, died on July 8, 1949, in Cleveland.

George Harrison Houston, 66, former president of the Baldwin Locomotive Works, the Wright-Martin Aircraft Corp., and the Wright Aeronautical Corp., died recently in an automobile accident while returning from Teziutlan near Mexico City.

Harold C. Bullard, 69, plant engineer, and a former director, the Bullard Co., died June 28.

W. M. Shanahan, 49, secretary and treasurer, Consolidated Vultee Aircraft Corp., died July 14 in San Diego, Calif.

Edwin C. Shultz, 51, advertising manager, Pratt & Whitney Div., Niles-Bement-Pond Co., died on July 5, in West Hartford, Conn.

George H. Pratt, 58, vice-president in charge of sales, Hudson Motor Car Co., died in Los Angeles recently.

Bayard (Bill) Sheffler, Los Angeles racing car driver, died in Trenton, N. J., recently as a result of an accident in a 100-mile championship AAA race at Trenton.

Edward P. Case, 63, inventor in the automotive field, died July 12 in Syracuse, N. Y. He invented the Case valve, the Case spark plug and Airway carburetor attachments.

Allegheny Ludlum Steel Corp.—**John W. Belanger** was elected a director of the company.

Superior Steel Corp.—The following appointments have been announced: **W. B. Holt,** as asst. to the vice-president in charge of operations; **Karl W. Grube,** as general supt. and **S. S. Rickley** as chief engineer.

Willys-Overland Motors—The election of **Gordon A. Roth** as assistant treasurer has been announced. **Paul B. Hartman,** assistant director of research has been made director of research. **Paul N. Sutton** has been appointed sales training manager.

Fairbanks, Morse & Co.—Announcement has been made that **T. M. Robie,** formerly manager of the Diesel Div., with headquarters in Chicago, has been appointed director of quality control for the company's Beloit Works. He is succeeded by **J. W. Wright,** who was manager of the diesel engine sales dept. in Kansas City Branch.

Joseph T. Ryerson & Son, Inc.—**J. L. McDermott** has been appointed manager of the Ryertex Div. He succeeds **Kenneth T. MacGill,** who is retiring.

Nash Motors Div., Nash-Kelvinator Corp.—The appointment of **Thomas S. Adams** as manager of the new Nash Motors plant at Toronto has been announced.

Worthington Pump and Machinery Corp.—**John J. Summersby** has been elected vice-president in charge of sales.

Borg-Warner Corp., Pesco Products Div.—**John A. Lauck,** chief engineer of the Pump Div., has been appointed vice-president of the Pesco Products Div.

E. I. du Pont de Nemours & Co., Inc. — **Benjamin M. May** has retired as general manager of the Rayon Department. He is succeeded by **Robert L. Richards. Andrew E. Buchanan, Jr.,** is asst. general manager.

The Sparks-Withington Co., Sparton Automotive Div.—The appointment of **James J. Bigelow** as sales manager has been announced.

Superior Steel Co.—**Paul W. Pheneger** has been appointed assistant to the president.

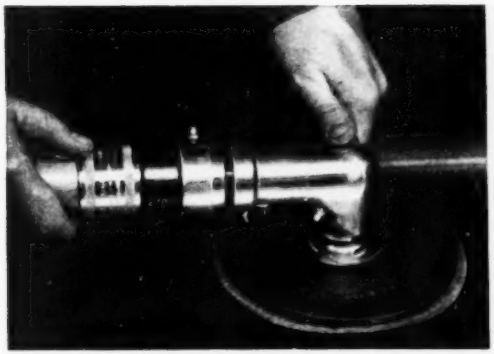
Pacific Airmotive Corp. — **Laurence H. Cooper** has been made vice-president and general manager.

Frederic Flader, Inc.—**Dr. Victor B. Corey** has been appointed manager of the engineering physics division. He succeeds **Carl L. Frederick,** resigned.

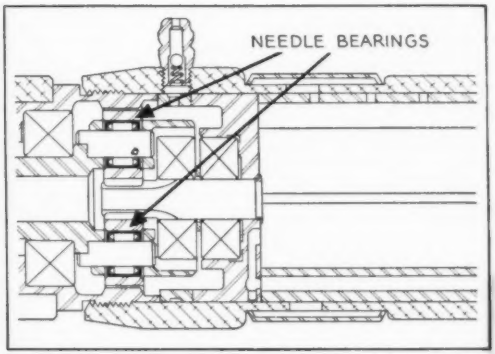
L. J. Miley Co., Inc.—**W. R. Brightmire** has been made sales manager.

Caterpiller Tractor Co.—**J. M. Davies** has been named director of research, succeeding **C. G. A. Rosen,** who is ill.

Torrington Needle Bearings Increase Power Output 10% in ARO Pneumatic Tools



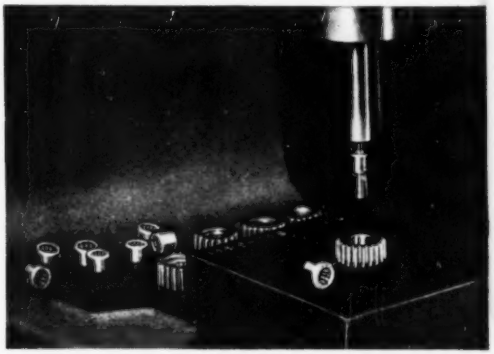
By Applying Torrington Needle Bearings in the planetary gears of the Model 7099 Screwdriver and Model 7095 Sander, Aro Equipment Corporation, Bryan, Ohio, increased power output 10%. This increase in efficiency, determined by special tests, is accompanied by reduced lubrication and maintenance, and longer service life.



No Major Design Changes were needed to adapt Needle Bearings to this application, shown above in cross-section. These compact anti-friction units met the space and weight limitations ideally, with no sacrifice of reliability. The full complement of small diameter rollers assures tremendous radial capacity.



Service Life Tests were run for as much as ten times the normal life of the tools. Previously, the planetary gears, shown above, had been a trouble spot – but the Needle Bearings and the pins that serve as shafts showed no appreciable wear when tests were completed.



Installation of the Bearings is a simple arbor press operation. Lubrication is greatly simplified, since the turned-in lips of the shell of Needle Bearings retain an ample reserve of lubricant. With wear reduced to a minimum, savings in maintenance may run as high as 20 to 1, according to the manufacturer's experience.

This case shows how the performance, lubrication and service life of *your* equipment can be improved by a simple change to Torrington Needle Bearings. Let our engineers help you adapt them to your needs. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities of United States and Canada.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller

Straight Roller • Ball • Needle Rollers

High Compression Without High Octane Fuel

(Continued from page 39)

tion chambers of Ricardo and Janeway are as follows:

1. Minimum initial temperature of mixture (at ignition).
2. Maximum cooling of the last gas to burn.
3. Locating the spark plug at or near the hottest area in the combustion chamber to make sure that this hot area is not where the last gas burns.
4. Non compact combustion chambers.
5. Volume distribution in the chamber around the spark plug for shock control.
6. Providing maximum flame spread at the early stages of combustion.
7. Restricting the flame spread at the intermediate and end of the burn.
8. The rate of pressure rise is a fundamental factor in shock.

Present Day Combustion Chambers

Space does not permit extension of the history behind our combustion chamber progress. However from the foregoing we may with benefit analyze the present.

Fig. 13 shows three modern L-head combustion chambers. They are essentially of the Janeway pattern except the increased emphasis on the mixture flow from valve to cylinder bore.

Fig 14-A, B, C, shows three overhead valve engines which follow the principles of high volume at the spark plug tapered to a clearance space or quench area. The "A" design is a definite wedge shape and the ignition point is over the exhaust valve. The intake valve is in the clearance space which has been recently decreased to gasket thickness. The "B" design is in the general direction of good. However, the clearance space is too thick and the exhaust valve is too near to the area where the last gas burns. "C" is a desperate attempt to meet all conditions. However, the exhaust valve is too far from the spark plug. It works fairly well and is very smooth but a little shy on power.

Fig 15 is a design that has been used by good companies with fair results. This chamber has a quench area on both sides of it and due to compactness the spark plug must be near the valves. It would not be smooth but should give good power and fair detonation control.

Fig. 16-A shows schematically what happens in the combustion chamber of aircraft engines during inflammation. Two spark plugs are located between the valves, on opposite sides of the combustion chamber and at relatively cool zones. After ignition the flame progresses toward the valves and the last gas to burn is at the valves, one of them red hot. Again the progress of the volume of gas burnt shows a constant increase up to the point of detonation which means that the shock due to the burn is at a maximum. Chemistry and water alcohol injection has been used to meet the problem of detonation with these engines in the present sizes. Beyond these sizes these palliatives will not suffice. The shock which is about sixteen times as great as it need be for the same pressures is not curable without redesign. Perhaps it is not possible to cure the excessive shock in these engines at all.

Using the Janeway factors as an approach we might have a design such as shown in Fig. 16-B. Here we find the plugs near the exhaust valve and a quench area between piston and the intake valve. This most certainly would improve detonation, at least it might mean that an engine requiring 125 equivalent octane and alcohol water injection would get by with 100 octane with alcohol-water injection. The problem would be how well could we cool the piston head. From the standpoint of shock this combination would be considerably better than present practice.

In 1946 this author recommended the F-head engine for vehicles in AUTOMOTIVE INDUSTRIES, Nov. 15-Dec. 15 issues of that year. The F-head is old, and although it has been used backwards or up-side-down in the past, it still provides a broad avenue of progress. It has recently been adapted by three concerns in Europe, Fig. 17-A, B and C. The last is under development in Central Europe. It does offer high breathing by way of an overhead, oversize intake vale in addition to excellent detonation and shock control. During 1947 and 1948 we had opportunity to build F engines in Europe and with 73 cu in. we obtained 43 hp at 4000 rpm. This would be equal to 130 hp for the 225 cu in. engines in general use in the U. S. developing 90 hp. The mpg U. S. was 51 at 40 mph for a 1900 lb car. This engine is shown in Fig. 17-C.

From experience we are bound to say that the F-head type with a flat top piston and intake valve in front of the clearance space or quench area will give more stable results than the F-head where special piston heads are used which develop their own hot spots and where the intake valve is in the quench area. It may be because the mean temperature of the solid quench area is less than when the intake valve is present. It may be the fact that the cooling effect of the intake is deflected away from the hot spots in the chamber. I am certain from experience that you can more easily produce good engines by approaching the design of F-head as used by Rolls. The Rover design is a designer's dream since it seems to follow all the demands of accepted theory. However, it is far from a production engineering dream if you take into consideration the angular drilling and machining and the compounding of the tappet system.

Fig. 18-A represents two American engines and a new European truck engine. Here we find an ample quench area in an overhead valve engine and a tapered chamber for good shock control. However, they are limited to about 7.25:1 compression ratio for 80 octane fuel because the exhaust valve is too near the last gas to burn.

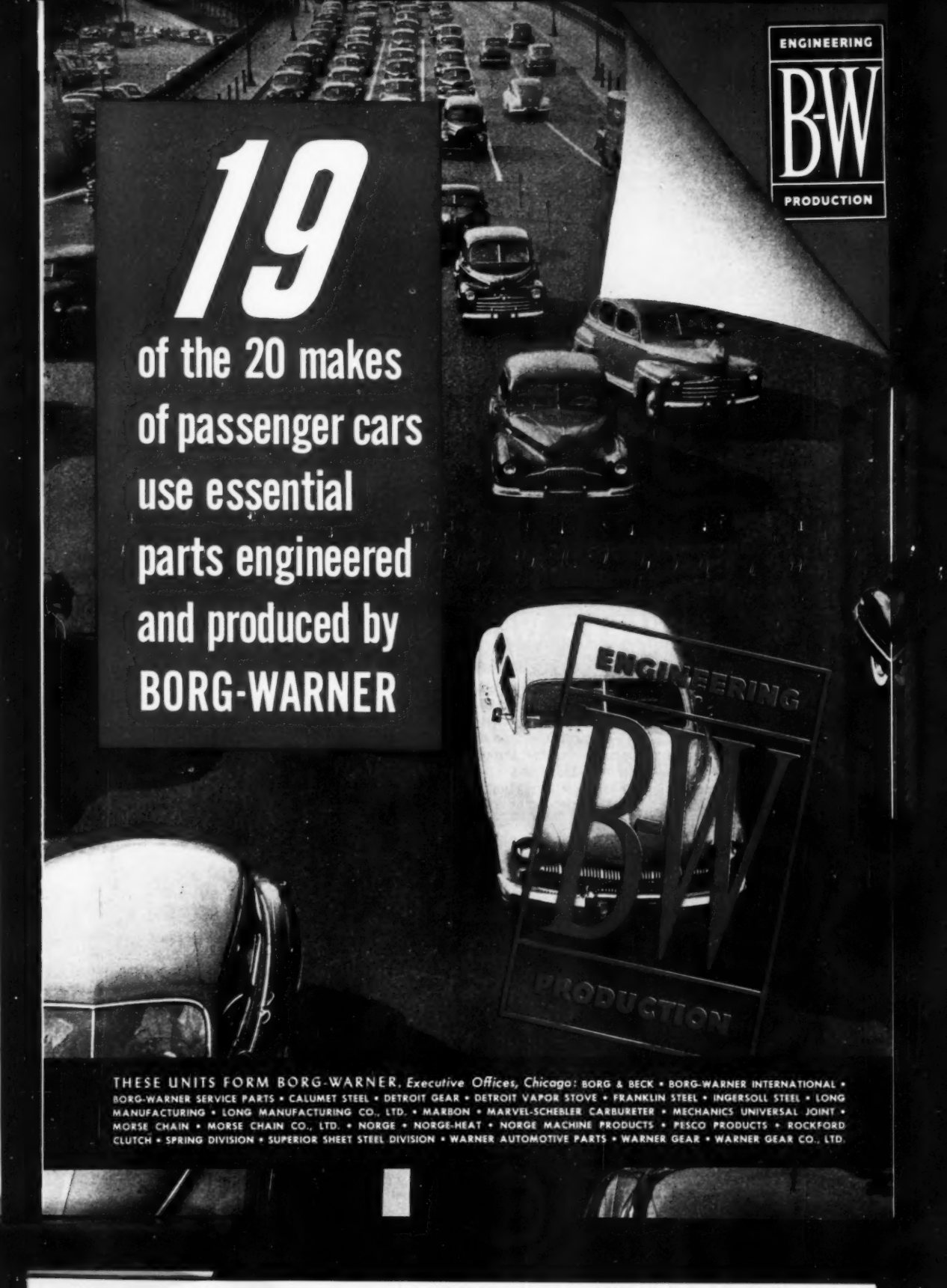
Fig. 18-B is a new design for Poland by its technical university people which is a compromise of American design, and if given space might not be too bad from the point of view of detonation. Here we see the valves in head in line but with the exhaust at a high position and intake valve almost at piston level. This is a compromise of the Chevrolet and Bedford truck engines with an effort to avoid drilling the valves at an angle. Such a head would fit well in an under-stroked engine but will be overcrowded with the ordinary proportions of bore and stroke and cylinder bore centers that the Poles are likely to use. Such a design would develop overheated exhaust valves since they are masked so completely from the intake flow.

In examining the past and the present with an eye to the future it becomes clear that the internal hot spots, the high temperature of the exhaust valve in particular, must be eliminated or made innocuous. This was a common statement in the industry, made with reference to its being something desirable but unattainable. This author now would say the answer has been with us right along but we all have chosen to ignore it.

The final installment of this four-part article will appear in an early issue of AUTOMOTIVE INDUSTRIES.

BOOKS ...

DIESEL ENGINES, 2nd EDITION, by *J. W. Anderson*. Pub. *McGraw-Hill Book Co.*, 558 pages. A great deal of progress has taken place in the Diesel engine field since the publication of the first edition of this text in 1935. Hence the second edition has been largely rewritten and expanded to include new developments as well as the experience gained during the last war. Chapters on combustion chambers and fuel injection equipment, in particular, have been brought up to date. From the standpoint of designers and users alike, the new text covers the subject in detail from generalizations of theory and design to a high-spotting of commercial engine features. In general, the text covers all manner of diesel engines now on the market, from the largest stationary and marine units to the smaller automotive sizes. Among the design features covered are: scavenging, charging, and supercharging; combustion chambers; fuel injection systems; governors, control, and safety equipment; cooling systems; fuels and fuel systems; starting systems; installation.


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Valve Guide Bushings

(*Continued from page* 41)

machine in position to feed into the vertical magazine.

The vertical magazine is loaded automatically by means of an air-operated pin, timed with the indexing mechanism of the machine. A vertical push-rod moves the magazine load upward one bushing at a time. As the parts reach the top section of the vertical magazine, they take the curved patch downward and feed by gravity to the loading station at the fifth position, marking the start of the second index.

In addition to loading and unloading, this station also is provided with an intermittent air blast, serving to clear the collet mechanism of chips. It may be noted that in leaving the first index position the work is turned end-for-end in the magazine chute so as to present the opposite end for the second operation.

At the first position, second index, the 5/16 in. hole started on the first index is drilled through with a Tantung drill. At the third position, the hole is reamed to 0.3320-0.3325 in. with a cemented-carbide tipped reamer. At the same time a turning tool comes in from the side to turn the body; while a form tool comes in from the other side to face and chamfer the end. Automatic ejection of the finished parts takes place at position five.

In keeping with current practice, the form tools as well as the turning tools employ solid square bits of cemented carbide. Forming tools have the cutting formation ground at each of the four corners so as to present four new cutting edges before tools are removed for grinding.

Following the cycle in the automatic, the parts go to a centerless grinder for finish-grinding the OD. The last stage is precision-boring in the two-spindle boring machine. This machine incorporates several elements developed by Cadillac to assure its successful operation. For one thing, it has a double diaphragm chuck designed to hold the work accurately. Tool heads are cam-operated in such fashion as to bring the fly-cutters on the bars into cutting position only on the return stroke.

As the bars enter the work an externally mounted cutter relieves the OD for a short distance from the end. On the return stroke, the tool heads incline slightly to bring the fly-cutters into play for boring.

An unusual feature of the cutting bars is that they are made of solid cemented-carbide for most of their length. At the extremity a short piece of mild carbon steel is brazed on, serving as the holder for the single-point tool. The cemented-carbide bars have enormous rigidity as compared with steel and this is responsible for the ability to bore the small hole accurately.

Aluminum Wheels

(*Continued from page* 45)

As illustrated, the forged aluminum wheel is made in two sizes—20 and 22-in.—for a rated axle capacity of 18,000 lb. It has five spokes and has been designed specifically for the application. The proportions of the spokes and section modulus are based upon stress-coat studies made in the Alcoa laboratories in Cleveland. Typical properties of the A51S-T6 alloy are as follows:

Tensile strength	—48,000 psi
Yield strength	—43,000 psi
Shearing strength	—32,000 psi
Endurance limit	—11,000 psi

The forging operation is made in three stages—rough forging from the billet, finish-forging, and trimming in a press. Machining is done by the supplier later on.

From a design standpoint the physical properties of the forged wheel are said to be adequate for trailer service. As a matter of fact, experimental wheels have been tested for endurance and have withstood several million cycles of repetitive stress without failure.

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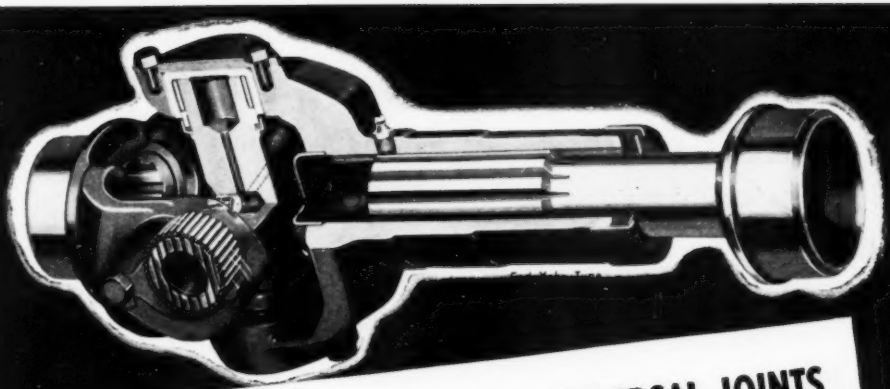
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Accuracy—Precision fits and surface finishes assure vibrationless, trouble-free, dependable operation.



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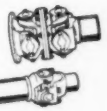
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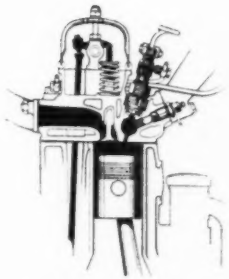
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Mercedes-Benz Exhibits Diesel Car

(*Continued from page 26*)

another passenger car equipped with a high-speed engine and capable of a maximum speed of 75 mph. The engine displacement is only 4 per cent greater than that of the engine which can be replaced by the Diesel, but its output is 52 hp at 4000 rpm. The frame is composed of tubular longitudinals of oval section which are fairly close together at the middle of their length and spread apart toward both front and rear. Tubular cross members or outriggers support the body. Coil-spring suspension is used all around. The firm also exhibited a 3¼-ton Diesel truck. It is equipped with a six-cylinder 250-cu in. engine developing 90 hp at 2800 rpm. This is a new version of an older model and incorporates many improvements, the empty weight having been reduced from 7600 to 6500 lb. The gross vehicle weight being 14,300 lb, the ratio of pay load to vehicle weight thus was increased from 0.93 to 1.15. Other new features are rubber mounting of the powerplant, an oil cooler, improvements in the precombustion chamber of the engine, a five-speed transmission, welded frame, progressive (variable-rate) rear springs, and a well-equipped cab with pressure ventilation, heater, and defroster.



Transverse section of Mercedes-Benz 170 Diesel passenger car engine (Drawing from Motor Rundschau)

Butadiene Output Down in 1948

Preliminary estimates of 1948 production of crude products from petroleum indicates that output of butadiene, a major ingredient for GR-S type of synthetic rubber, fell to 661 million lb from the 696 million lb reported in 1947, according to the United States Tariff Commission.

Correction for Caption "Sporty Romeo"

The car shown on page 19 of the July 1 issue of AUTOMOTIVE INDUSTRIES captioned "Sporty Romeo" is a Fiat 1100B with body by Farina, powered by a four-cyl engine, and it sells for about $4000 to $5000.

Taper Skin Milling

(*Continued from page 32*)

method of cutting pieces from a 48 in. by a 130 in. minimum size sheet.

Experience gained in recent months in producing tapered sheets has outlined the nature of improvements to be made to render the equipment more versatile and economical. Design studies and cost estimates made on variations of the hold-down method suggest that a separate hold-down plate for each part number is very feasible; since each plate can be made to the exact outline of the part, much saving of raw material can be effected by nesting more than one part in a single stock size sheet.



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General News

(*Continued from page 23*)

ing registration fees, gasoline taxes, city and county taxes, bridge, tunnel and ferry tolls, and excise taxes hit new highs in 1948. *Automobile Facts & Figures* states that federal excise taxes, which are not used for highway purposes, reached a total of $1,157,000 last year, representing nearly a third of the total. This type of tax was begun in 1932 as a "temporary emergency" tax and has risen steadily since that time both in rates and in total revenue.

Stanley Aviation Gets More Contracts

Contracts just awarded to the Stanley Aviation Corp., Buffalo, N. Y., by the Air Force, Navy and National Bureau of Standards total $182,000 and lift to $319,562 the backlog of this busy company. Just one year old this month, Stanley Aviation has already filled military contracts valued at $127,323. New contracts include: (1) development of a new crew seat for high speed aircraft; (2) development of containers in which military "cargoes" weighing as much as three tons are dropped by parachute for use in combat; (3) development and installation of control refinements in a Fairchild C-82 Packet cargo plane; (4) development for the Navy of new electronic fuel-measuring instruments for aircraft; and (5) photographic print dryers for both ground installations and airborne operations.

SBAC Has Standardized 6000 Aircraft Parts

Eleven years ago the Society of British Aircraft Constructors (SBAC) initiated an important program of standardization work within the aircraft and airplane-engine industries. So far, it has produced some 6000 minor and major standard parts. Apart from the standardization of actual components and equipment, the SBAC has endeavored to do the same with techniques employed by aeronautical specialists for making performance and other measurements. It has, moreover, played its part in the work sponsored by the British Institution of Standards which is principally interested in issuing specifications for materials. The use of SBAC standards is called for by the British Ministry of Supply in the aircraft it buys, and its representatives serve on the committee responsible for introducing designs. But the aircraft industry has complete freedom in deciding the items which are to be standardized, and the form they should take.

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Demonstrator for Simulating Auto Manifold Vacuum

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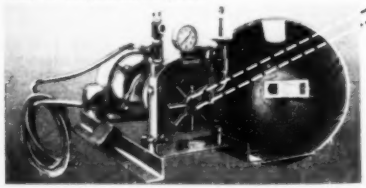
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PROBLEM: Assure an even flow of dry bulk concrete through hopper of storage bin.

SOLUTION: Aeration of material with low pressure air (8½ c.f.m.; to 15 p.s.i.) from Gast Unit.

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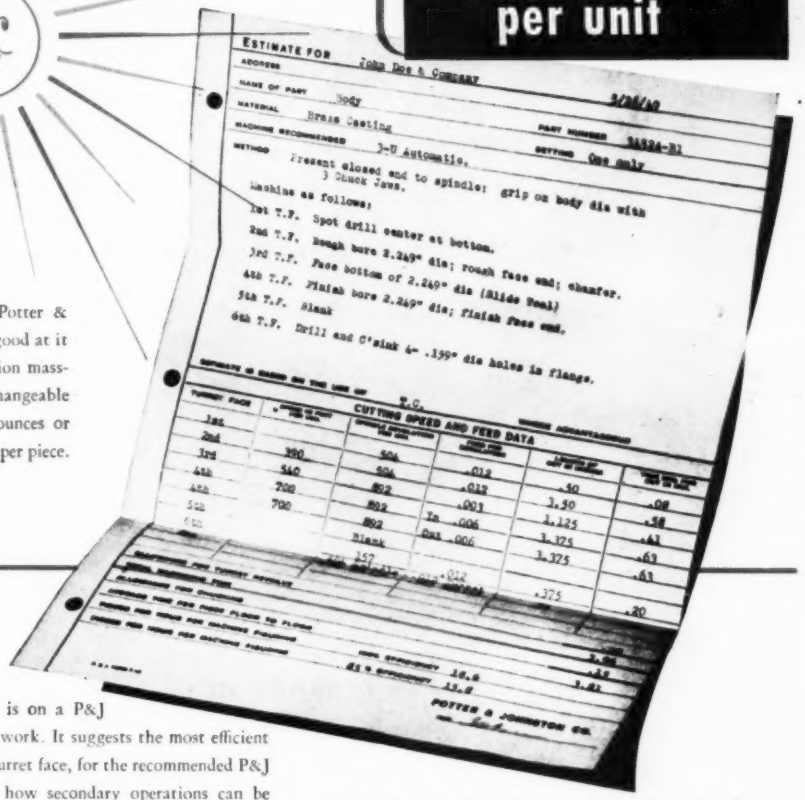
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(*Continued from page 51*)

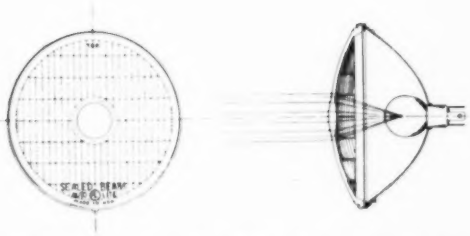


Diagram of Auto-Lite's "Bulls-Eye" sealed beam headlamp unit

F-33—"Bulls-Eye" Headlamp Unit

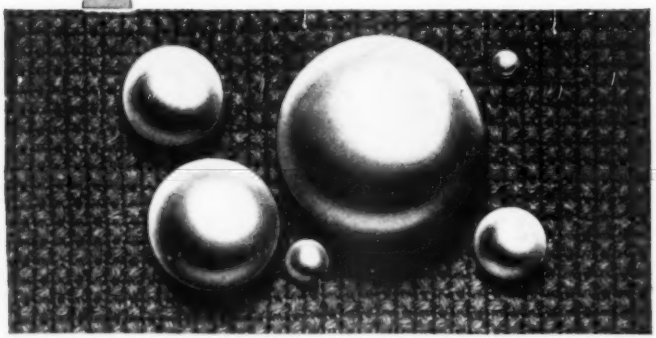
Development of a new Sealed Beam headlight unit, featuring a specially designed "Bulls-Eye" lens with marked lighting advantages, is announced by the Electric Auto-Lite Co., Toledo, Ohio. The unit, now in large-scale production and available for both original equipment and the replacement market, delivers a driving beam of higher intensity than previous Auto-Lite units.

The unit picks up the unreflected light from the bulb filament and projects it into the main headlamp beam to give a driving beam of higher intensity. Because the increased candle power of the beam is controlled through the "Bulls-Eye," it does not, however, place an additional burden on the approaching driver. The intensified beam is accomplished by collimating prisms which pick up the reflected light from the bulb filament and collimate it into a beam which projects the light into the main headlamp beam.

Other features of the Bulls-Eye lamp include a new aluminized reflector which whitens the light and keeps it white, and a new method of sealing the glass lens to the metal back of the unit.

The product is described as light in weight with the feature of continuing to operate though the lens is cracked or broken. The product is said to have approval of highway departments in all states where approval is required.

IN size and spherical accuracy
perfection of surface
uniformity—dependable physical quality



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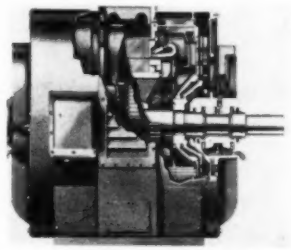
And the service results from every Strom metal ball prove it—not only in the finest precision ball bearings but also in the lot of other ball applications where Strom balls are doing the job better.

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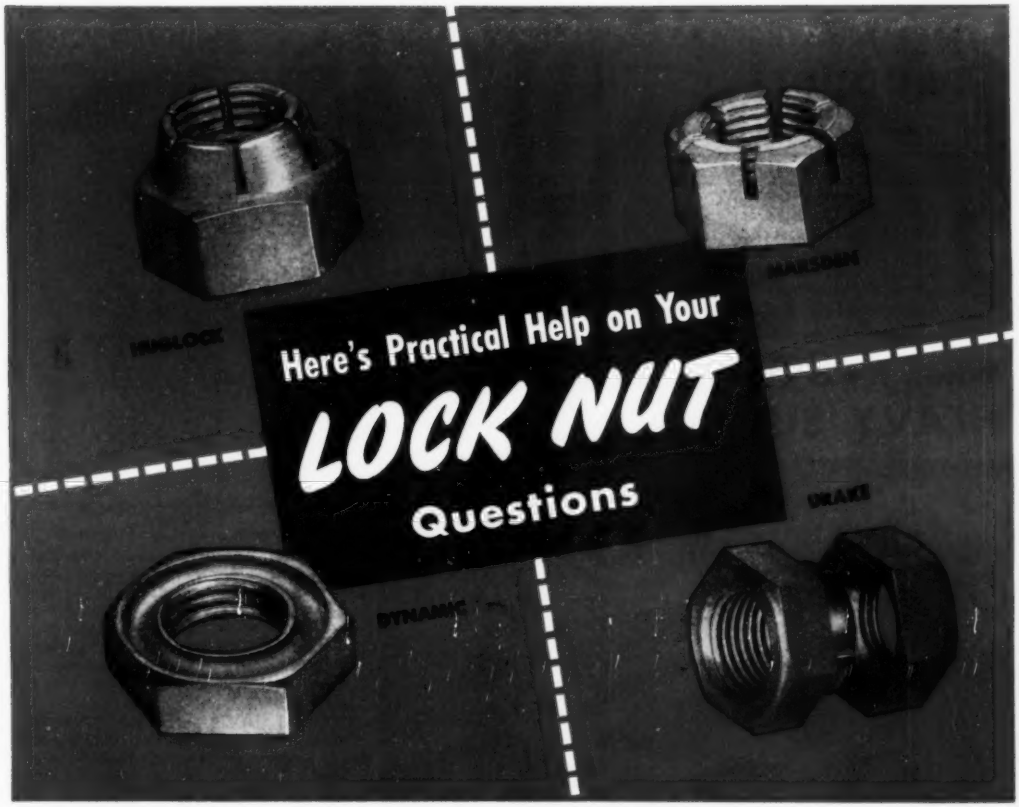
F-34—Enclosed Induction Motor

Type CS, totally-enclosed, fan-cooled, squirrel-cage motors with copper fins embedded in the stator laminations for additional cooling are announced by Westinghouse Electric Corp., Pittsburgh, Pa. Because of the excellent heat transfer ability of copper, motors of this design are said to require little more installation space than open motors of the same rating.



Westinghouse copper-fin totally enclosed induction motor, Type CS

(*Turn to page 68, please*)



Every problem of vibration and loosening of parts calls for careful study to find just the right answer. "National" engineers have encountered just about every type of problem, and our line of Lock Nuts is designed to meet an unusually wide range of requirements. The booklet illustrated here contains much useful data and should be helpful in determining type, size and cost of lock nuts for a given application. A copy will be sent on request.



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CHESTER HOISTS.

For heavy duty — National's "Drake" Lock Nut withstands severe stress, shock or vibration. A two-piece, positive lock for use on rugged, heavy equipment, where size and weight are not a factor.

To withstand shear only — National's "Dynamic" Lock Nut is a thin, lightweight nut with diaphragm lock, for use where clearance is a factor and where strains are in shear only.

For shock-loading or vibration, even under heat, oil or moisture, National's "Huglock" Lock Nut is a one-piece, all-metal lock nut. Easily installed, it grips the bolt threads and maintains locking effect whether seated or not.

For effective, low-cost locking. National's "Marsden" Lock Nut is a one-piece, cantilever action type, easily applied, free running until seated. For the most complete line of standard and special fasteners, come to "National".

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NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 52

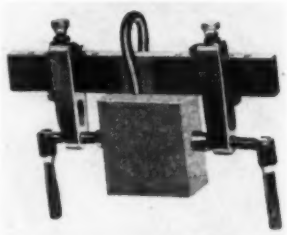
(*Continued from page 66*)

Rapid conduction of heat from the stator is accomplished by interleaving circular copper punchings at intervals among the core laminations. These copper fins extend beyond the core iron so that the heat picked up can be transferred to the external cooling air. Additional copper fins are fabricated with steel parts to form large, cylindrical heat exchangers at both ends of the motor around the end turns. Heat picked up by internal air circulating through the rotor is transferred through these heat exchangers to the external cooling air.

Motors are suitable for application where the atmosphere is contaminated with dust particles that are injurious to an open motor. Motors are not designed for outdoor locations where snow or other foreign materials may be encountered in such quantities as to obstruct the ventilating openings.

Type CS totally-enclosed, fan-cooled motors are available in large ratings up to approximately 1500-hp at 1800 rpm, class B insulation, 75 C rise, and other electrical characteristics similar to those that can be obtained in standard, open, squirrel-cage induction motors.

F-35—Non-Slipping Grizzly Lifter



Pucel multi-purpose non-slipping Gonser grizzly lifter

Pucel Enterprises, Inc., Cleveland, Ohio, has built a multi-purpose, non-slipping lifter for handling bulky and awkward materials and equipment in machine shops, boiler and welding shops, heat treating plants, pattern shops, etc. The tool eliminates use of chains, ropes, slings, pinch bars and C clamps.

Called the Gonser grizzly lifter, its various interchangeable attachments are constructed of an all hardened tool steel. The lifter bar, available in various lengths, has easily readable calibrations in inches for accurate balanced lifting and lowering and quick adjustment and locking of jobs. The swivel joint locking handles require no tools for tightening. In production work only one adjustment is necessary, the balance of the job being done with established calibrations.

Jaws are reversible to permit either inside or outside clamping.

F-36—Production Sander



Model 5000 "Electric"—Electrically powered sander introduced by National Air Sander, Inc., Rockford, Ill., is a production sander for heavy use, driven by a 115 volt ac-dc, 1/4 hp. continuous duty electric motor. The sander weighs 7 lb with 38 sq inches of abrasive area, is vibrationless and claimed to run cool.

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These 4 TIMKEN® graphitic steels will fill most of your tool steel needs!

GENERAL PURPOSE

TIMKEN GRAPH-MO

Timken® Graph-Mo is a *general purpose* oil hardening tool room steel. It offers big advantages for any tool job that requires a steel with excellent machinability, exceptional wear resistance, freedom from scuffing and scoring, structural stability, excellent response to heat treatment, and good anti-frictional properties.

SPECIAL PURPOSE

TIMKEN GRAPH-TUNG
for extra resistance to abrasion

Graph-Tung possesses all the general advantages of Timken graphitic steels, plus extra high hardenability to resist abrasion.

TIMKEN GRAPH-AL
for extra impact strength

In addition to the general graphitic tool steel advantages, Timken Graph-Al has shallow hardening properties that make it stand up well under impact.

TIMKEN GRAPH-M.N.S.
for extra strength in small cross-sections and long lengths

Timken Graph-M.N.S. has unusually high strength and rigidity, in addition to the other Timken graphitic steel advantages.

TIMKEN graphitic steel contains free graphite and well-distributed carbides in its structure. As a result, graphitic steels (1) machine fast and easily, (2) resist wear and abrasion and retain lubricants better, and (3) have minimum tendency to scuff, seize, or score. Timken graphitic steels also respond uniformly to heat treatment, have uniform stability.

The Timken Company offers four specially developed analyses of Timken graphitic tool steels to meet your individual requirements. Timken Graph-Mo is a general-purpose tool steel. Graph-Tung, Graph-Al, and Graph-M.N.S. are for special applications. For the latest information on all four graphitic steels, write for the new, enlarged 9th edition of the Timken Graphitic Tool Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

Business activity declined generally during the week ended July 2. The *New York Times* index of activity for that week stands at 133.4, as compared with 144.2 in the preceding week and 141.8 a year ago.

Sales of department stores during the week ended July 2, as reported by the Federal Reserve Board, equaled 237 per cent of the 1935-39 average, as compared with 247 in the week before. Sales were 11 per cent below the corresponding distribution a year ago, as against a preceding decline of six per cent. The total in 1949 so far reported is four per cent less than the comparable sum in 1948.

Electric power production declined more than seasonally during the week ended July 2. The output was 4.7 per cent above the corresponding amount in 1948 as compared with a similar advance of 4.0 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 644,182 cars, 19.8 per cent less than the figure for the week before and 14.9 per cent below the corresponding number recorded in 1948.

Crude oil production in the week ended July 2 averaged 4,819,950 bbl daily, 69,450 bbl less than in the preceding week and 663,850 bbl under the comparable output in 1948.

Production of bituminous coal and lignite during the same week is estimated at 1,360,000 net tons, 10,490,000 less than the output in the week before and 2,318,000 below the corresponding quantity in 1948.

Civil engineering construction volume reported for the week ended July 7, according to *Engineering News-Record*, was $138,526,000, or 13 per cent less than the preceding weekly figure and 18 per cent below the comparable sum in 1948. The total recorded for 27 weeks of this year was 16 per cent more than the corresponding amount in 1948. Private construction for the period was 13 per cent above that a year ago, and public construction increased by 19 per cent.

The wholesale price index of the Bureau of Labor Statistics during the week ended July 5, at 152.7 per cent of the 1926 average, was 0.1 per cent less than in the preceding week and 8.7 per cent below the corresponding figure in 1948. Price increases of farm products and foods were more than offset by declines in most of the other major commodity groups.

Member bank reserve balances decreased $32 million during the week ended July 6. Underlying changes thus reflected include a decline of $96 million in Reserve bank credit and increases of $233 million in money in circulation, $235 million in Treasury deposits with Federal Reserve banks, and $39 million in non-member deposits and other Federal Reserve accounts, accompanied by an advance of $5 million in gold stock.

Total loans and investments of reporting member banks decreased $24 million during the week ended June 29. A decline of $111 million in commercial, industrial and agricultural loans was recorded, marking the 24th consecutive weekly reduction. The sum of these business loans, $13,181 million, shows a net decrease of $1164 million in 12 months.



Does your design problem involve sealing shafts or valves against leakage, controlling temperature or pressure, transmitting motion? Whatever your problem, you may find that Hydron Bellows Assemblies will give you greatly improved results. It's well worth finding out before your designs are too far advanced. Clifford engineers will give you recommendations based on your sketches and specifications—at no cost or obligation. Write: CLIFFORD MANUFACTURING COMPANY, 128 GROVE STREET, WALTHAM 54, MASS. *Division of Standard-Thomson Corporation.* Offices in New York, Detroit, Chicago, Los Angeles.

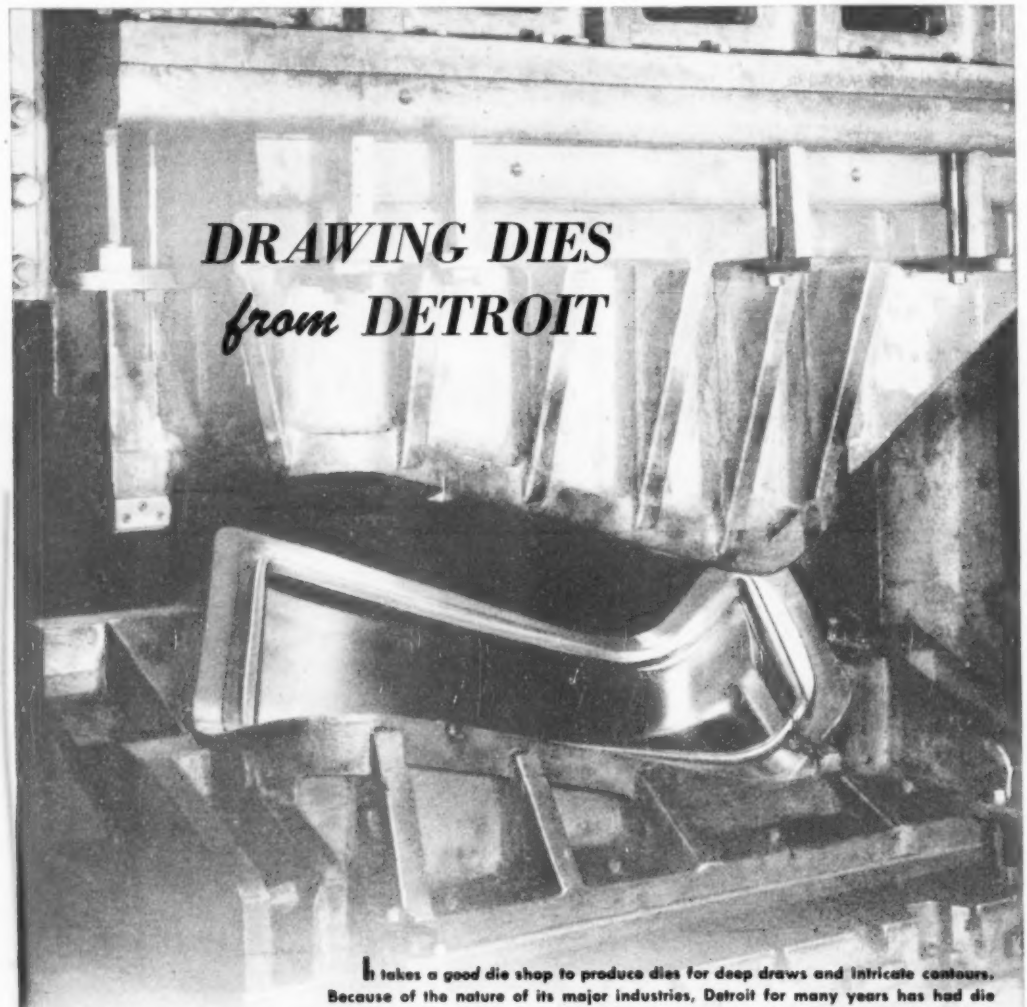
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Richard Brothers' abilities go much further than the actual building of dies. Here are men who, from long experience, know what can be done in the drawing of sheet metal. They can and do offer solutions to die design problems that show an end-result in clean, accurate stampings produced with a minimum of scrap. These are abilities that are most quickly recognized in drawing die work, yet are applied equally to the production of sheet metal dies of *every* type—from the largest to the smallest.

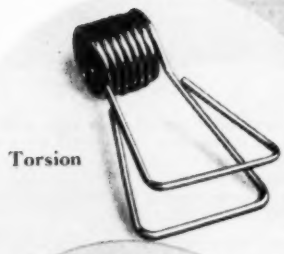
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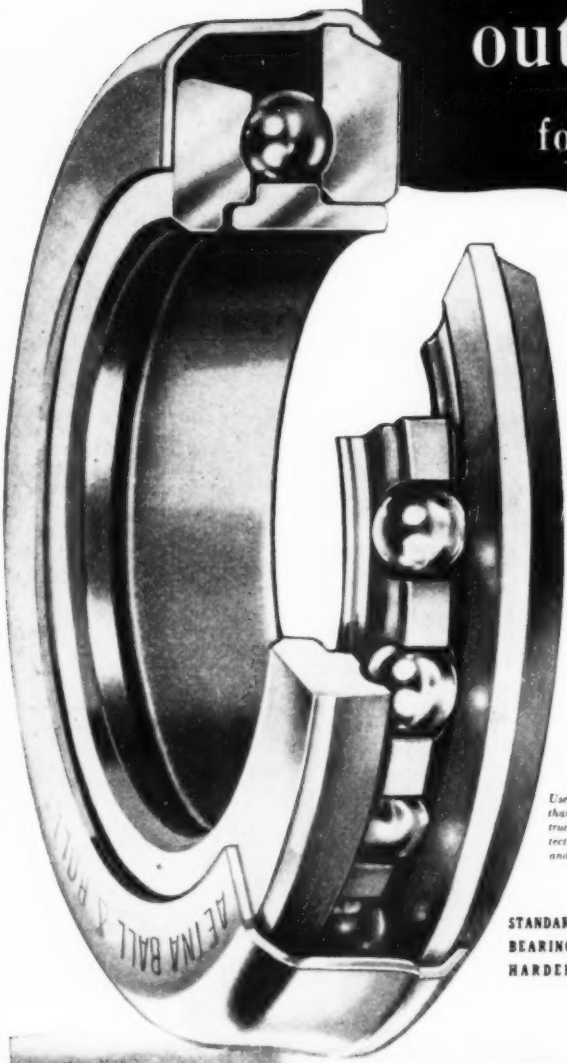


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For those hard working clutch assemblies, for instance, it's good business to specify Aetna T type clutch release bearings. Aetnas, as you can see in the cross section opposite, are designed with one-piece, T shaped oil impregnated bronze ball retainers which end all the troubles common to conventional type bearings. Note, for example, how the T locks balls and raceways in permanently true alignment. That means complete absence of eccentric thrust and its resultant noise and punishing wear. Aetna design provides an exceptionally large grease reservoir that's factory-packed with the best lubricant obtainable. Thus Aetnas are not only pre-lubricated but POSITIVELY lubricated for life. Nor can the lubricant escape and cause slippery clutch facings. No oil fittings, no extra installation or maintenance costs are necessary. Investigate. Learn the many other reasons Aetnas deserve a place in your specifications. AETNA BALL AND ROLLER BEARING COMPANY, 4600 Schubert Avenue, Chicago 39, Illinois. In Detroit: SAM T. KELLER, 2457 Woodward Avenue.

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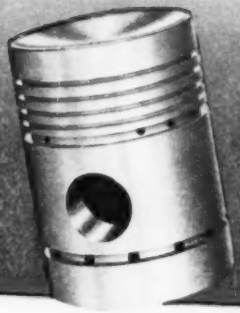




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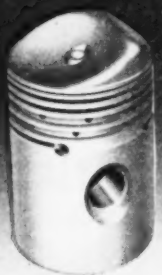




Two Cycle



Steel Truss



Turbulator head



T-Slot



Trunk Type

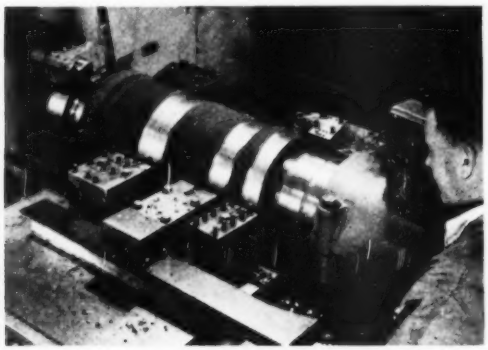
STERLING ALUMINUM PRODUCTS INC.

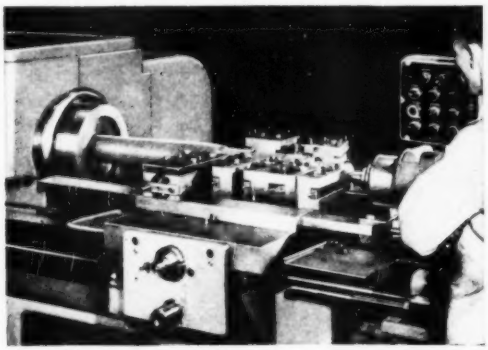
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Heavy Turning Jobs...

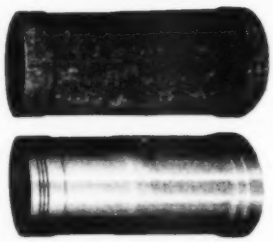
On SUNDSTRAND Multiple Tooled 75 H.P. Automatic Lathes

If you have large work requiring turning and heavy stock removal, here's the lathe for the job. This heavy duty automatic lathe (17″ swing over slides) has the same highly productive features of all Sundstrand Automatic Lathes . . . quick cycle changeover, simplicity in adjustments, wide range of carriage cycles and feeds and speeds together with a high rapid traverse rate. *In addition, a 75 horsepower spindle motor* provides ample power for heavy cuts and carbide cutting tools. Here are a few examples of heavy turning jobs done on the Sundstrand Model 16. If you have similar work, call in a Sundstrand engineer.





66 Hours Saved Turning Lot of 20 Cylinder Liners



Liners are 32″ long by 15¼″ diameter and are processed in lots of 20 pieces. With old machines and method, roughing time was 60 hours for 20 pieces. Sundstrand multiple tooled Model 16 rough turns same number of parts in only 10 hours. Tooling is then changed for finish turning. Five different diameters, three .253″ grooves in the O.D. and an additional groove in the end wall diameter are completed in this operation. Finish turning time was cut from 24 hours to 8 hours. Part illustrations show rough and finish turned cylinders.

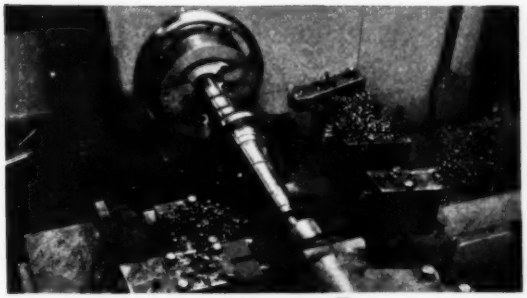


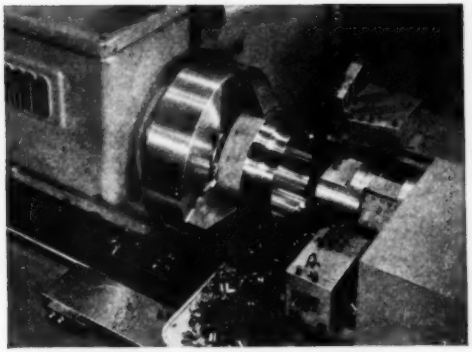
300% Production Increase On Heavy Tractor Shafts

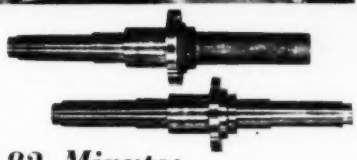
This tractor shaft is a steel forging (285 Brinell). It is rough turned, faced and formed complete in two operations on a Sundstrand Model 16 Automatic Lathe. Lot size is 350 pieces. First operation tooling shown above has nine carbide tipped tools. Maximum depth of cut is ⅞″ — HP consumed at peak load is 79. Over 18 pounds of metal is removed per minute. Production on the Sundstrand is over 5 per hour compared to 1¼ by the former method. Here is a good example of the use of multiple tooling and an automatic cycling 75 HP Sundstrand Model 16 Lathe for improving turning production.

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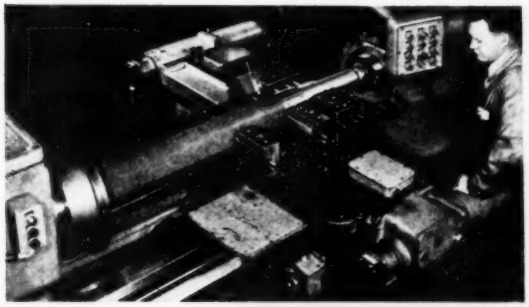
Turning Time Cut From 23.7 to 3.82 Minutes

This track sprocket shaft is 1045 steel forging with a hardness of 212 Brinell. It is completely turned in two set-ups on a Sundstrand 75 HP Model 16 Automatic Lathe which has ample power to make full use of multiple tooling and carbide tipped tools. The first operation which is illustrated above is rough turning, facing and forming one end with nine tools. H.P. consumed at peak load is 84 — maximum depth of cut is 7/8". Production on the Sundstrand is 8 shafts per hour compared to 1.6 shafts by the former method. Here is another good example of the fast metal removal possibilities of the Sundstrand Model 16 Automatic Lathe.



Turning, Facing, Boring and Chamfering Gear Assemblies

These split gear assemblies are machined in two operations. In the first, the part is chucked on the rough O.D. One-half of O.D. is then turned together with boring, facing and chamfering operations on one end. Part is then reversed and same operations performed on opposite end. Material is an extremely hard alloy steel of 400 Brinell. Speed is 366 S.F.P.M. — maximum depth of cut is 5/8" — production is 10 per hour for each operation.





85 lbs. of Steel Removed in 9 Minutes

The generator shaft shown above is 63 inches long and is of 1045 steel bar stock. It requires the turning of five diameters on one end, four on the other. One end of a lot is turned in first operation, then shaft is reversed, tools re-set and opposite end turned in second operation. The generator shaft is only one of over 30 different shaft parts run on the Model 16 Automatic Lathe.

FREE

Additional Data



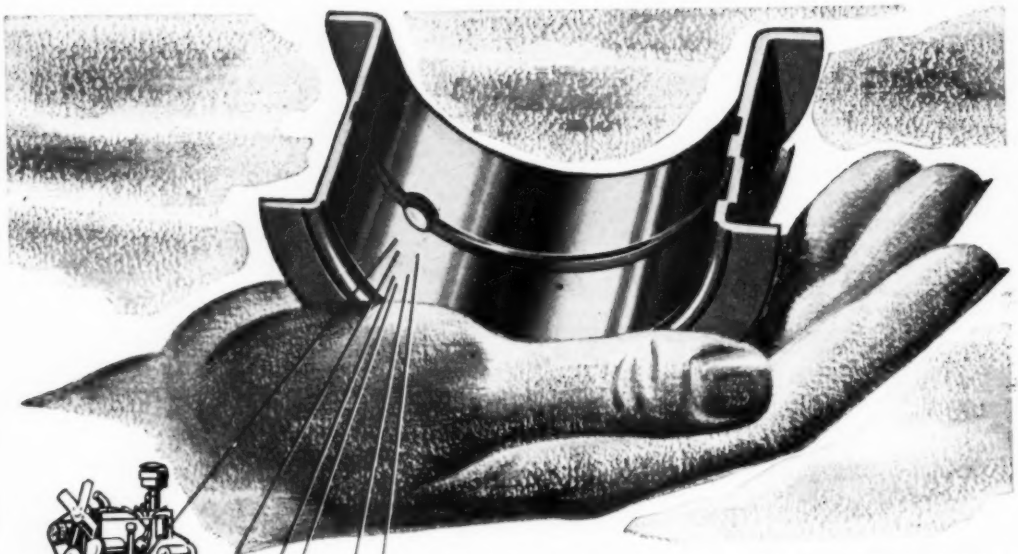
How you can save time on turning large parts is further explained in this free folder covering engineering data and specifications on the 75 horsepower Sundstrand Automatic Lathe. Write for your copy today. Ask for bulletin 286

SUNDSTRAND

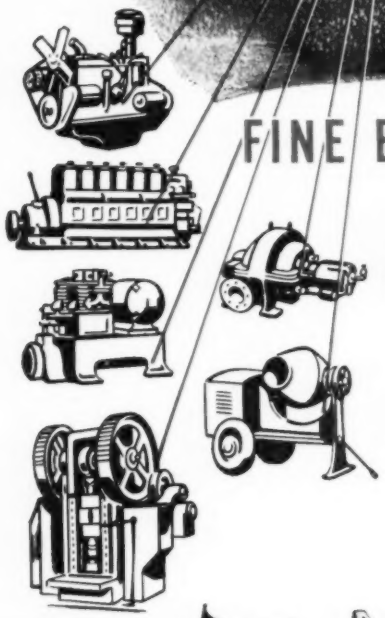
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One type of Federal-Mogul sintered copper-lead main bearing requires 25 separate manufacturing operations, a total of 84 measurement checks and 24 temperature, analysis and special tests.

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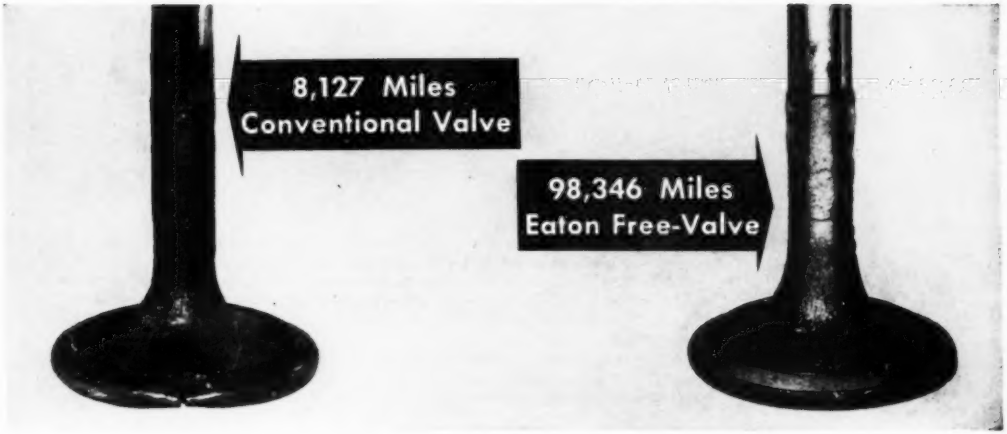


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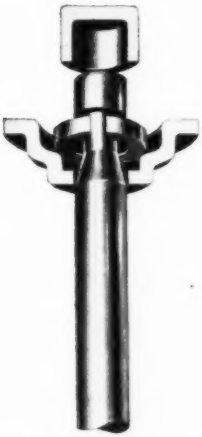


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eliminate valve failures between major overhauls



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PERFORMANCE... Fuel consumption and power output maintained at new-engine level to major overhaul.

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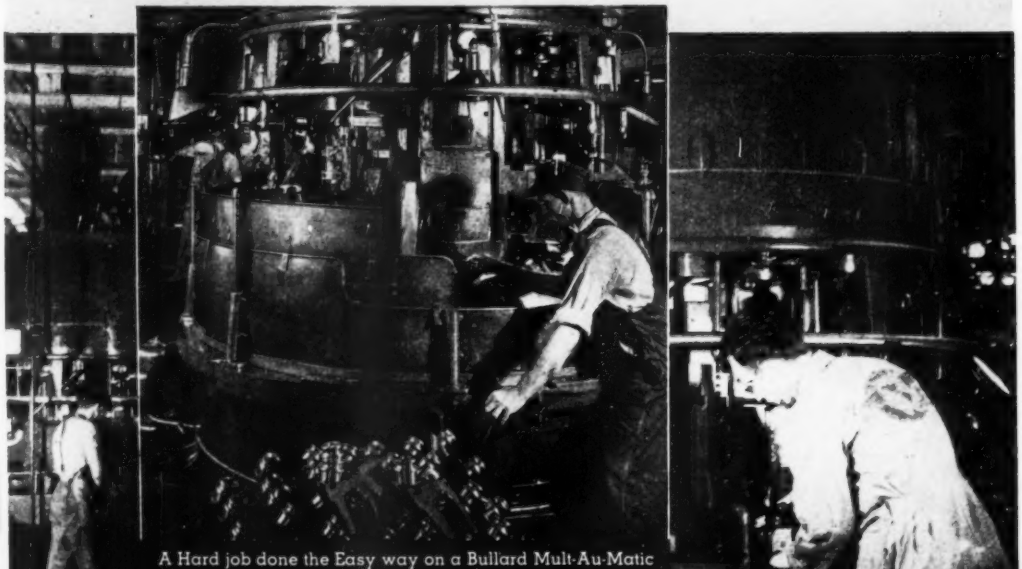
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A well known axiom "The whole is greater than any of its parts" leads us to consider—Men and Machines. Mult-Au-Matics are designed and built with a thought to the human operating element. Operators on every hand acclaim this viewpoint and produce accordingly. Therefore, with men and Mult-Au-Matics, Production Volume is only limited by the Ability of the Mult-Au Matics themselves.

This Ability or Productive Capacity is definitely stated in Bullard Engineering Estimates on your work. We suggest that you take advantage of our Engineering Service with a view to making comparative studies. Reflect on your comparisons, and at the same time Reflect on—Men and Mult-Au-Matics—The Profitable Combination.

BULLARD



A Hard job done the Easy way on a Bullard Mult-Au-Matic

Mult-Au-Matics in Models and Sizes to meet your requirements

Type "D"—8", 12", 16"—6 or 8 Spindles

Type 16-23"—8 Spindles

Type "K" 9½" to 10¾" Capacity 6, 8, 12 or 18 Spindles

Send us your work samples or blueprints for Engineering Estimates.

THE BULLARD COMPANY

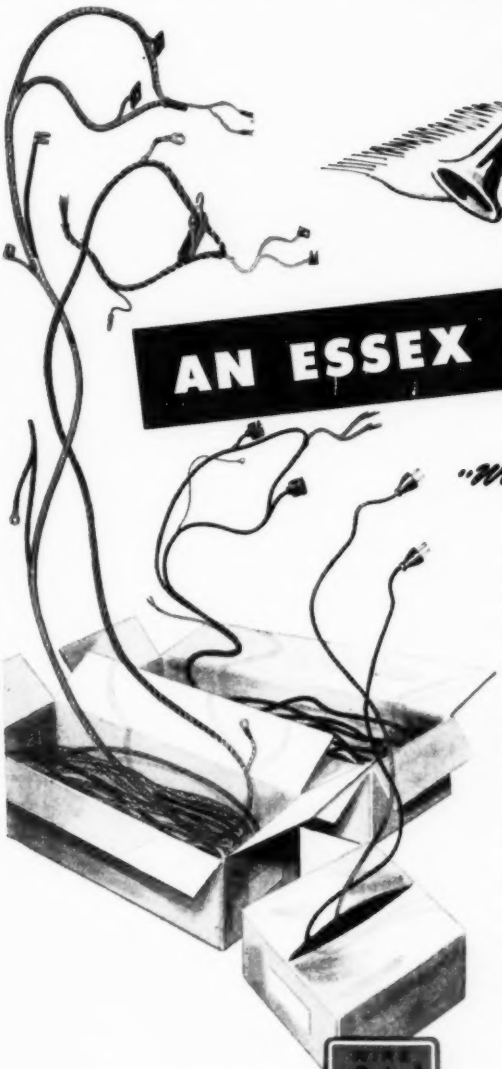
BRIDGEPORT 2, CONNECTICUT

You pipe the Tune!



AN ESSEX NERVE SYSTEM

...will give a Great Performance



Regardless of the song you sing, from Opera to Bop —cord set to automotive harness—the most economical, dependable and uniform performers have repeatedly proved to be ESSEX WIRE ASSEMBLIES.

No matter how complex your harness problem, Essex experts can solve it and save you time and trouble. The Essex Wire combined staffs of specialists completely engineer and outfit your assemblies with all of their electrical components, making a *completely* integrated unit to Essex high standards.

The Essex network of 20 plants develops, manufactures and controls these custom-tailored assemblies from wire bar to your appliance. Because of Essex intense specialization, complete control of overall operation and long experience (dating back to the days of the early automobiles) you are safeguarded against an electrical failure that can turn your "masterpiece" into a dead duck.

One sample of an assembly built to your specifications will prove why Essex leads. Ask for one. Call our representative today, or send your specifications to the factory.

BUILT TO PERFECTION — *PROVED BY INDUSTRY*

WIRE ASSEMBLY AND CORD SET DIVISION

ESSEX WIRE CORPORATION MONTICELLO, INDIANA

KELSEY-HAYES

AUXILIARY VACUUM POWER PUMP

Essential for Safest Truck and Trailer Brake Action!



Simple to install on In-Line or V-8 engines . . . Complete kits available with dual check valve and lubricator for all power brake systems

Here's an improvement you can easily add to the present power brake system of your trucks and trailers . . . and one that you actually can't afford to do without, because it has remarkable safety over your present conventional vacuum brake operation:

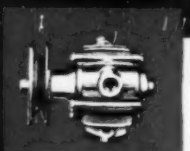
1. Maintains adequate reserve of vacuum power in the system, even when the engine manifold vacuum fluctuates widely, due to operating conditions, engine wear, etc.

2. Actually increases the vacuum power above the maintained adequate reserve, thus providing a far faster brake application that is 30% to 50% more effective, while retaining smooth action, easy control, and low maintenance cost.

3. Merely a small, simple addition to present, conventional power brake systems (no major units to replace).

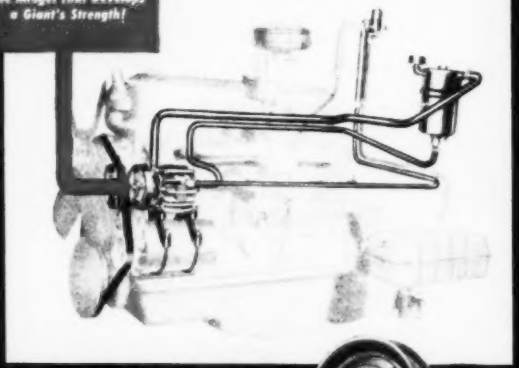
4. Exceptionally sturdy, its few parts moving in a bath of oil have proven practically non-wearing during long, continuous service.

Kelsey-Hayes Auxiliary Vacuum Power Pumps are of utmost importance to every truck and trailer maker, operator, service man.



The Midget That Develops a Giant's Strength!

ADDS 30% TO 50% MORE POWER TO POWER BRAKE SYSTEMS!



Distributors gladly furnish descriptive literature



KELSEY-HAYES ASSURES PROVEN PRODUCTS AT

KELSEY-HAYES WHEEL COMPANY

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Wheels—Hub and Drum Assemblies—Brakes—"Vacdraulic" Brake Power Units—for Passenger Cars, Trucks, Buses—made by Kelsey-Hayes' 4 Michigan Plants and Windsor-Canada Plant • "Magdraulic" Electric Brakes • "Lathan" Vacuum Power Brake Equipment for Tractor-Trailers—made by Kelsey-Hayes' South San Francisco-Lathan Plant • Wheels—Hubs—Axles—Parts for Farm Implements—made by Kelsey-Hayes' French & Hecht Plant at Davenport, Iowa.



1 **1770**—Improvement of livestock by selective breeding boosted milk output . . . encouraged dairy farming. City folk now began to sample this wonderful beverage. But harmful bacteria in milk caused sickness, spread disease.

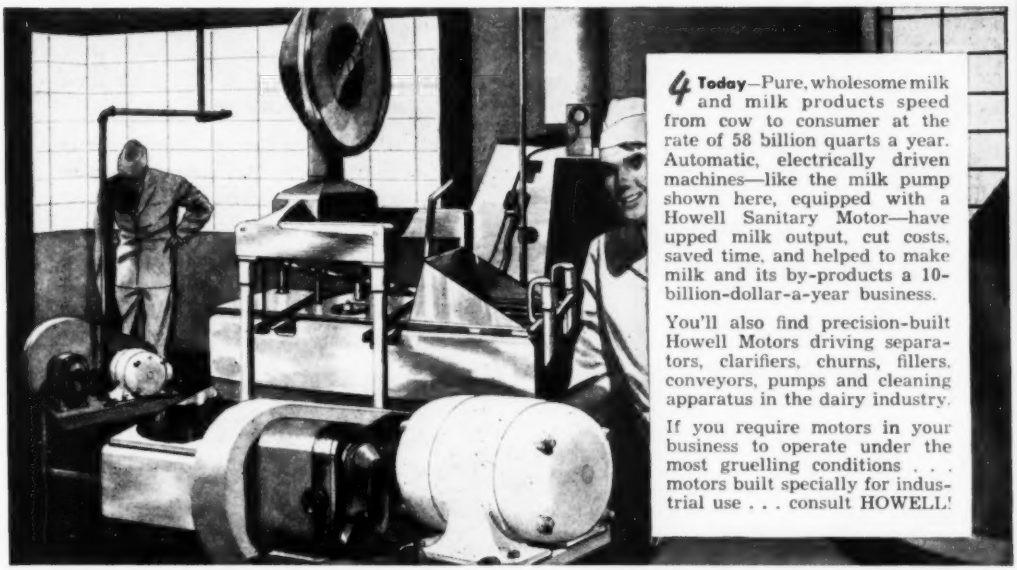


2 **1864**—France's Louis Pasteur won world acclaim by discovering how to rid milk of impurities. Milk soon became an important source of food. Vitally needed was electrical horsepower to speed it from farm to consumer.



3 **1915**—The year Howell Electric Motors arrived also marked the widespread use of the automatic rotary bottle filler and capper in the dairy industry. Soon, these rugged, industrial type motors were widely sought in many industries.

MILK . . . 58 BILLION QUARTS ANNUALLY!



4 **Today**—Pure, wholesome milk and milk products speed from cow to consumer at the rate of 58 billion quarts a year. Automatic, electrically driven machines—like the milk pump shown here, equipped with a Howell Sanitary Motor—have upped milk output, cut costs, saved time, and helped to make milk and its by-products a 10-billion-dollar-a-year business.

You'll also find precision-built Howell Motors driving separators, clarifiers, churns, fillers, conveyors, pumps and cleaning apparatus in the dairy industry.

If you require motors in your business to operate under the most gruelling conditions . . . motors built specially for industrial use . . . consult HOWELL!

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

SANITARY MOTOR

For dairy and food processing industries. Complies with latest 3-A Sanitary Specifications.



HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS



GO! STOP! SHIFT! REVERSE! JOCKEY!
ALL EASIER FOR THE DRIVER!

LIPE ML CLUTCH

NO BABYING! NO GRAB! NO SHOCK! NO JERK!
MORE CONTROL FOR THE DRIVER...
MORE CLUTCH HOURS ON THE ROAD!

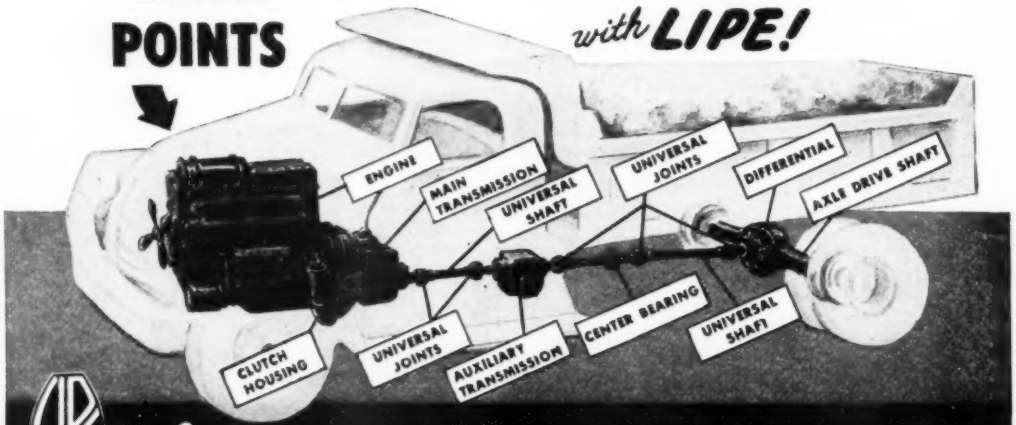
Actually, the Lipe ML Clutch engages so smoothly that it gives the driver more control over the vehicle. Saves wear and tear of vital gears, drive shaft, axles, universal joints and bearings. This means less maintenance . . . more hours on the road.

Simple design—The Lipe ML Clutch has only one spring. Its 20 louvred levers act instantly, simultaneously, uniformly . . . and circulate air for cooler operation.

Easier adjustment—The simple removal of a few shims compensates for the dissipation of friction material. With ordinary tools, a mechanic can easily disassemble and reassemble the Lipe ML Clutch.

EASIER! ON THESE 14 VITAL POINTS

LESS MAINTENANCE *with* LIPE!



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Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

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PROPER surface preparation is essential to prevent peeling and flaking of paint finishes applied over zinc coated sheets and zinc die castings.

Bonderizing produces a corrosion inhibiting surface on zinc and its alloys which effectively prevents chemical reaction between the zinc and the paint ingredients.

The nonmetallic crystalline Bonderite coating is integral with the metal itself, thus providing a secure anchor for the paint and retarding the formation and spread of corrosion.

Bonderizing for zinc is simple, economical and effective. Investigate it for your zinc production.

TECHNICAL BULLETIN AVAILABLE NOW!

Write today for details on Bonderizing for zinc. Free technical bulletin will be mailed on request.



Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

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2178 East Milwaukee Ave.
Detroit 11, Michigan

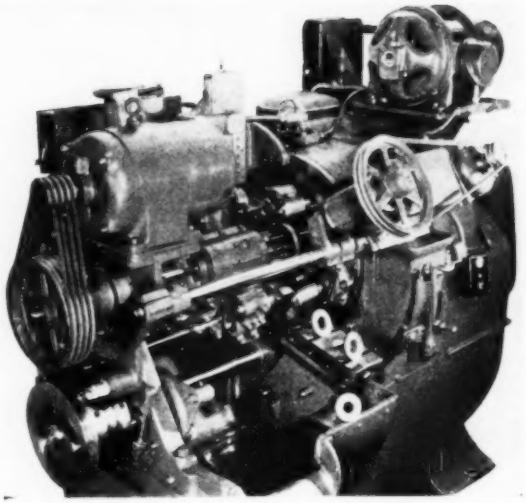
BONDERITE corrosion resistant paint base . . . PARCO COMPOUND rust resistant . . . PARCO LUBRITE wear resistant for friction surfaces

No. 76 H CHUCKER

Has VERSATILITY

You can combine turning, drilling, tapping, threading, milling, etc., operations.

TRY "Baird" for high production of Automotive Parts requiring finely finished surfaces and close limits.



For Instance:

The picture shows a tool set-up to turn the O.D. and top of a small piston and then cross drill the wristpin hole in the piston in a located position, in one handling and the same machine tooled to turn and then drill the six holes in the cylinder cover plate shown in the picture.

Some of the EXCLUSIVE FEATURES which have made the Baird 7 Six-Spindle Horizontal Indexing Lathe outstanding are:

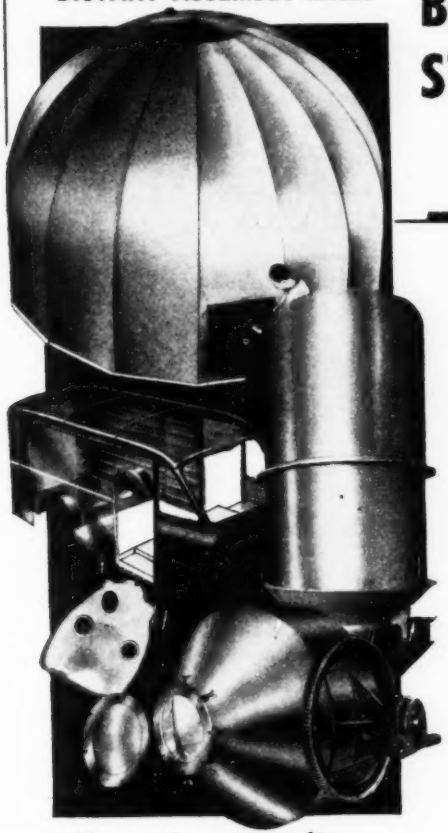
- INDEPENDENT TOOL SLIDES
  The longitudinal tool slides may have different strokes and the cross slides are independent and have their strokes, all as best suits the job. All tool slides have micrometer adjustment.
- DIFFERENT SPEEDS AT SPINDLES
  Ability to choose a speed for the spindle at each work station to suit the operation to be performed at that station permits the best product in least time.
- AUTOMATIC CHUCKING
  Operator has both hands free to handle the work. No levers or handles to require his attention or take his time.
- ATTACHMENTS
  Several readily applied attachments are available to perform extra operations and reduce handling, thus speeding production.
- AUTOMATIC MECHANICAL STOP
  Stops machine at end of each cycle if operator has not unloaded and reloaded in the proper operation of machine. This and other safety features make for least loss due to damage, and for greatest safety.

"ASK BAIRD ABOUT IT"

OTHER BAIRD MACHINES: MULTIPLE SPINDLE GRINDERS, WIRE FORMING MACHINES, PRESSES, TUMBLING EQUIPMENT

THE BAIRD MACHINE COMPANY
STRATFORD, CONN.

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BRANDT STAMPINGS CAN STEP UP ASSEMBLY AT YOUR PLANT TOO!

On schedule delivery of Brandt stampings *where* you want them, the *way* you want them in *quantities to fit* your own specific assembly line needs. That's what Brandt is doing for a wide range of industries all over the country. A leading automotive manufacturer in Detroit, the U.S. Navy's "Operation Mothball," a large electrical manufacturing company, are examples of industries where Brandt mass produced stampings help solve the difficult problem of efficient assembly line operation.

YOU MAY SAVE WITH THESE FACILITIES, TOO! Brandt offers several hundred thousand square feet of streamlined production facilities, 50 stamping presses from 10-1000 ton capacity, 30 press brakes from 50-1200 ton capacity, shears, arc and spot welding batteries, punches, bonderizing equipment, etc. A complete, versatile organization of skilled workmen and experienced engineers equipped to fabricate in a wide range of metals. Proximity to steel mills and to strategic rail, water and highway transportation plus thorough shipping and crating facilities add to customer satisfaction.

SEND PART, SAMPLE OR DRAWING. Your inquiry will be promptly expedited by the Brandt Engineering Department.

When it's gotta fit . . .

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covering all issues from

January 1, 1949 to June 15, 1949

The 20-page AUTOMOTIVE INDUSTRIES Editorial Index, to be issued soon, saves hours of searching for specific subjects covered in past editions, and comes in 8½"xll" size for easy filing.

It provides you with a quick summary of ALL the editorial articles, listed alphabetically by subject, along with page numbers and dates of the issues in which they appear. Also includes a cross-index by author and company mentioned.

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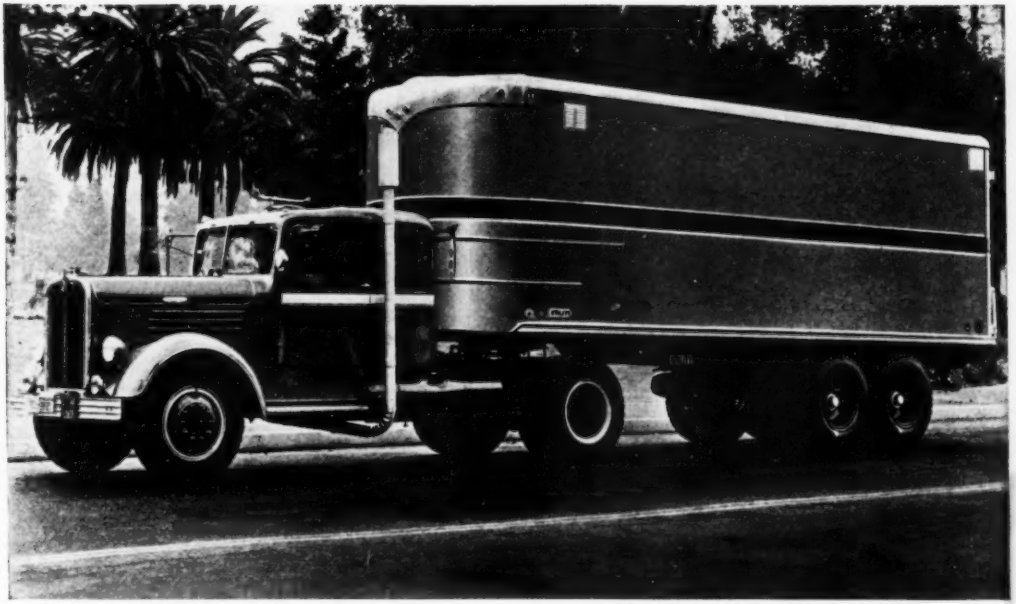
Philadelphia 39, Pa.

Please send me the new AUTOMOTIVE INDUSTRIES Editorial Index covering the 12 issues from January 1 to June 15, 1949, inclusive, for which I enclose 50¢. (I would also like to order the next 6 months' index, both for $1.00, which I enclose). Forward index to:

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Get Rid of 15% to 40% Deadweight at Low Cost with **Mayari R**

Show any fleet operator where you have slashed several hundred pounds of deadweight from a truck, trailer or semi-, and you'll have him interested. Explain how you have made this design improvement at slight cost by using Mayari R high-strength, low-alloy steel and the chances are there's a sale in the offing.

Mayari R has everything the manufacturer needs. Its properties range well above those of the ordinary carbon grades. This means that it can be used in thinner gages to reduce weight without sacrificing essential strength. Or, it can be used in equal gages to improve the strength of the vehicle without adding to its deadweight. In either case it has 5 to 6 times more resistance to atmospheric corrosion than plain carbon steel of equal thickness. Another important point to remember is that paint lasts as much as 80 pct longer on Mayari R than it does on carbon steel.

As far as fabrication is concerned, Mayari R is formed, sheared, punched, machined and welded by the same methods and on the same equipment used for ordinary steel. The only difference is that some allowances may be required for its higher properties.

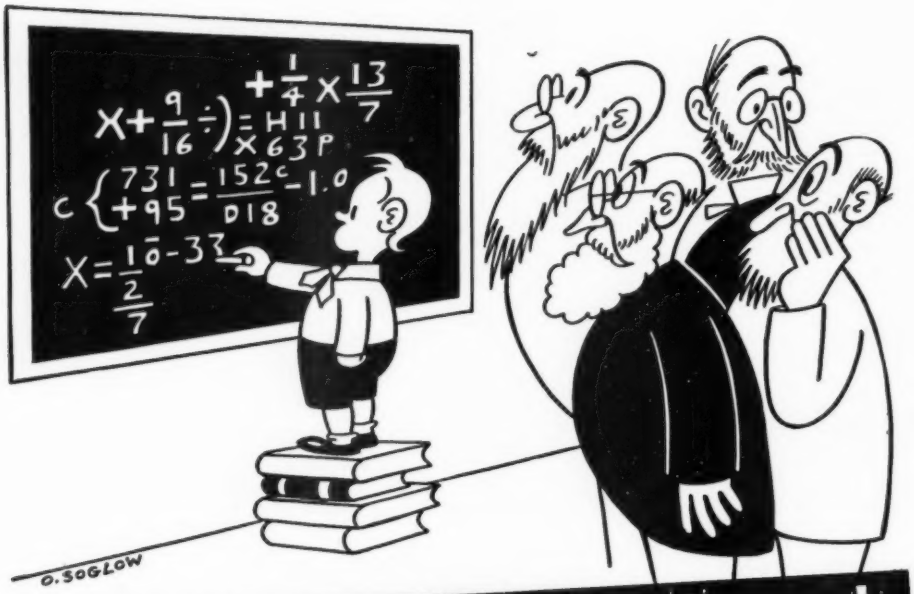
Our new 52-page Mayari R catalog covers the truck and trailer applications of this steel in detail. Write or phone our nearest office for your copy.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

Mayari R *makes it lighter... stronger... longer lasting*



You'll be surprised at these figures!

- 80 million Americans own $48 billion of U. S. Savings Bonds.
- 20,000 of the nation's 38,000 firms employing 100 or more persons are operating Payroll Savings Plans.
- 7,500,000 workers are buying an individual average of $20 of Bonds per month.
- For the year 1948, sales of Series E Bonds *exceeded redemptions* by $495,148,000. The net figure for all Series after redemptions and maturities was $2,151,140,000.

What does all this mean to you? Well, it means first of all that your Treasury Department is successful in its program of increasing the nation's economic security by spreading the national debt. Secondly it means that most of the nation's business leaders recognize the value of the Payroll Savings Plan sufficiently to promote it within their companies.

For example...

To give you some idea of the Plan's growing popularity: 86,384 employees of a prominent electrical manufacturing company were investing in Bonds at the rate of $30,005,270 as of the end of 1948. This is a gain of nearly 100% over 1947, when 45,000 employees participated in that company. The treasurer of a well-known shoe company reported that, of his concern's 19,000 employees, 9,240 were in the Plan and had invested $146,807.32 in Bonds via deductions during the preceding month.

Why promote it?

We all know how buying Bonds builds an individual's future security. But there are *company* benefits too! Nation-wide experience shows that Payroll Savings increases each participating employee's peace of mind—makes him a more contented, more productive worker. It reduces absenteeism, lowers accident rates, increases output, and improves employee-employer relations.

It's easy to boost participation

1. See that a top management man sponsors the Plan.

2. Secure the help of the employee organizations in promoting it.

3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.

4. Make a person-to-person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

Nation-wide experience indicates that 50% of your employees can be persuaded to join—without high-pressure selling. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bond Division.

The Treasury Department acknowledges with appreciation the publication of this message

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.



TAKE THE NADELLA ROAD

IT'S THE ROAD TO SUCCESS...

THE
FAMOUS
ORIGINATORS
OF
NEEDLE CARTRIDGES
AND
NEEDLE BEARINGS
WITH NEEDLE RETAINERS

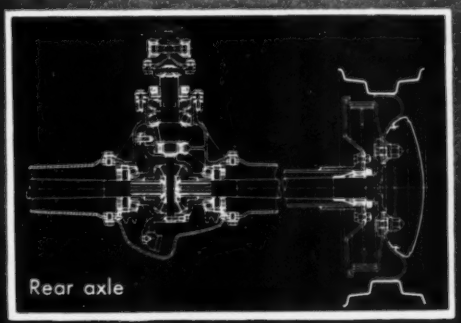
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needle cartridges

complete bearings

Special details on request



Rear axle

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GREASE RETAINERS
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GASKET PACKING MATERIALS

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Gasket Craftsmen
for 43 years

Gaskets of all types and materials

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Synthetic rubber extrusions—molded shapes—sheets. Cut parts produced to close tolerances and S.A.E.; A.S.T.M. specifications.

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Made to Meet Your Individual Production Requirements

The Besly man in your territory may be able to show you how to get a better finish, closer tolerance, increased output, lower costs—or all four. Write us.

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ANY SHAPE • ANY MATERIAL • COMPLETE FACILITIES

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Heavy, medium and light stampings in any quantity.
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RAILS *New and Relaying!*

TRACK MATERIALS
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Switch Material • Spikes and Bolts • Track Tools • Ties • Tie Plates • Bumpers • Complete Side Tracks

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SALES MANAGER WANTED. Southern California manufacturer seeks top flight sales executive equipped with a proved, successful record in directing sale of automotive service equipment through jobbers and direct. Must be ready, willing and able to apply this experience in assisting the general sales manager direct the efforts of a hard-hitting national organization of fifty men. Salary and other remuneration open, to be determined by applicant's past experience and demonstrated performance. Make first letter complete in every detail, including references. Strictest confidence will be maintained and material will be returned. Address: Box 70, **AUTOMOTIVE INDUSTRIES**, Chestnut & 56th Streets, Philadelphia 39, Pa.

ACCOUNT WANTED MICHIGAN TERRITORY — TOP NOTCH SALES ORGANIZATION, ESTABLISHED 15 YEARS, SELLING AUTOMOTIVE AND INDUSTRIAL PLANTS, SEEKS 1 OR 2 PRODUCTIVE OR NON-PRODUCTIVE LINES, DUE TO EXPANSION. STRONG PERSONNEL, COMPLETE OFFICE FACILITIES, SIX SALESMEN. GOOD ACQUAINTANCE IN LARGE AUTOMOTIVE AND INDUSTRIAL PLANTS. NOW DOING 2¼ MILLION FOR ONE ACCOUNT. COULD REPRESENT STEEL MANUFACTURER EFFICIENTLY. WRITE FULL PARTICULARS. BOX 69, AUTOMOTIVE INDUSTRIES, CHESTNUT & 56TH STREETS, PHILADELPHIA 39, PA.

FOR SALE—Thor Pneumatic Nut Setters. Two, 14ND, 5/16 in.; Model 4845; 450 RPM. Condition excellent. Priced new, $190.00. Price $60.00. Mr. Warner, Liberty Planers, Inc., Hamilton, Ohio.

Thor Hy-Cycle Tools. All 220 volt, 180 cycle, excellent condition. 15 screwdrivers, A-15, 3/16 in., Model 4891; 475 RPM; Priced new, $100.00. Price $17.50. 5 nutsetters, A-17, 3/16 in., Model 4927, 1000 RPM. Priced new, $100.00. Price $17.50. 5 studsetters, like above. Mr. Warner, Liberty Planers, Inc., Hamilton, Ohio.

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Penetrates into Leading Plants
in the
Automotive and Aircraft Industries



HI-EFF

BALANCING

- *Fast*
- *Accurate*

This 250-pound blower fan is being balanced to a 1 ounce inch on a HI-EFF Balancing Machine. The same Balancer is used for a wide variety of pieces up to 1200 pound size. It provides rapid balancing with accuracy indicated by the following tolerances:

Pieces weighing 500 to 1200 pounds, within 2 oz. inches.

Pieces weighing 75 to 500 pounds, within 1 oz. inch.

Pieces of lighter weights to diminishing tolerances down to .02 oz. inch.

HI-EFF Balancing machines are available in 5 sizes with work piece diameters up to 48 inches. These may be equipped with HI-EFF Hand Weighing Mechanism (as shown) or HI-MAX Direct Reading Mechanism. Write for folder "Balance Your Product."

TAYLOR DYNAMOMETER AND MACHINE COMPANY

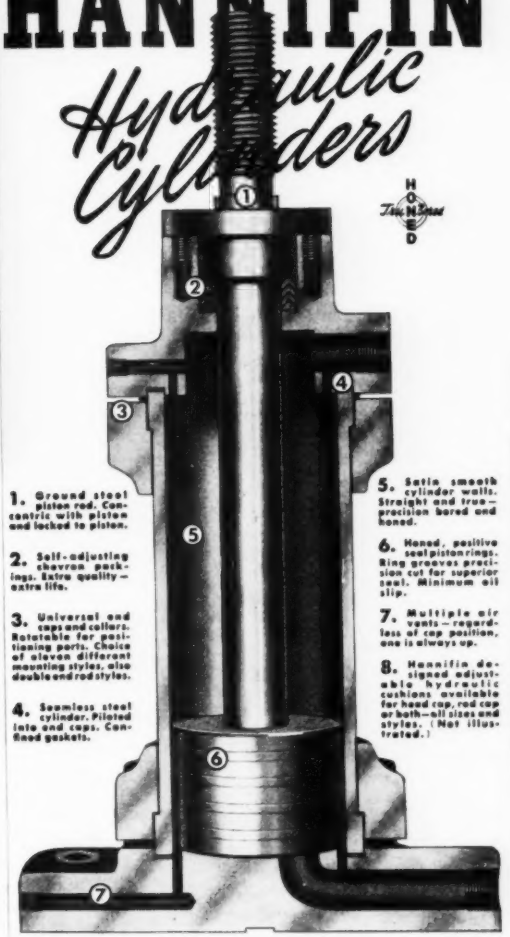
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MANUFACTURERS OF "HI-EFF" Hydraulic Dynamometers
Static Balancing Machines—Sensitive Drilling Machines

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Hydraulic Cylinders

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PRECISION BUILT for PRECISION PERFORMANCE!

Here is an improved type of high pressure hydraulic cylinder that is especially built to meet the most rigid requirements of makers of finest precision machine tools. Yet it is readily available in a complete range of sizes and styles and is economical for use on even the most ordinary installations requiring the application of hydraulic power. This is a result of Hannifin's standardization of construction . . . efficiency in production . . . and large volume output. *It pays to check with Hannifin on all of your cylinder requirements!*

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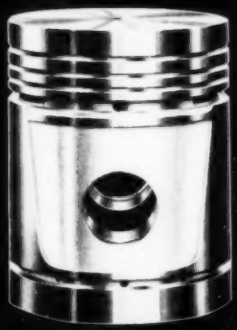

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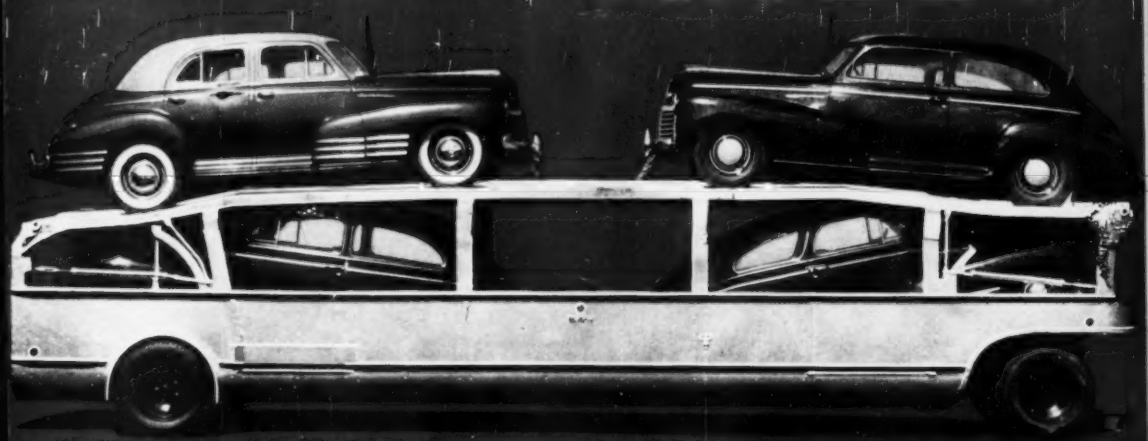
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